ARTICLE IN PRESS

Journal of Retailing and Consumer Services xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Retailing and Consumer Services

journal homepage: http://www.elsevier.com/locate/jretconser

# More bodily motor action, less visual attention: How supermarket stimuli and consumer-related factors influence gaze behavior

Wagner Junior Ladeira [a,*], Marlon Dalmoro [b], Fernando de Oliveira Santini [a], Juliane Ruffatto [a], Roberto Zanoni [a]

[a] Universidade Do Vale Do Rio Dos Sinos (UNISINOS), Unisinos Business School, Av. Unisinos, 950, Sao Leopoldo, RS, 93022-000, Brazil

[b] University of the Vale Do Taquari, Av. Avelino Talini, 171 - Universitário, Lajeado, RS, 95914-014, Brazil

ARTICLE INFO

*Keywords:*
Bodily motor action
Visual attention
Cognitive processes
Supermarket stimuli
Consumer factors
Gaze behavior

ABSTRACT

This research examines the relationship between bodily motor actions and the focus of visual attention when consumers are selecting retail products. Based on a quasi-experimental study that was conducted to explore the level of visual attention, collected through the eye-tracking system, it can be seen that the amount of information captured by gaze behavior is conditioned by bodily movement at the front of a shelf. The viewpoint emerging from this paper is that cognitive processes stimulated by vision are deeply rooted in the body's interactions in the retail environment and may also be influenced by stimuli associated with the particular supermarket, as well as by factors relating to individual consumers.

## 1. Introduction

Imagine watching a rushed consumer hastily shopping at the supermarket: their swift bodily movements give you the impression of impulsiveness, agitation and lack of attentiveness. However, might the rapid movement of the body, induced by walking at speed, be interfering with their visual attention? Specifically, can we be sure that this consumer has the minimal necessary cognitive processing skills to enable them to make sound judgments or coherent decisions? It can be assumed that this consumer would make more controlled and informed choices if s/he remained in a stationary, or relatively immobile, bodily stance at the front of a shelf.

Bodily movement has always been important in understanding man's relationship with his environment. The human body was treated as a prison of the soul by the Greek philosopher Plato. In Judeo-Christian thought, the human body was seen as the site of sin. In the words of French philosopher, René Descartes, the human body was a separate entity from the mind. After thousands of years, studies exploring bodily movement (bodily interactions, motoric processing, somatic signals and offline cognition) have been used to understand consumer preference, judgment and decision-making (Topolinski 2010; Reimann and Bechara 2010; Krishna and Schwarz 2014).

Recently, in-store field studies have been conducted using mobile eye-tracker applications - those in which the participant needs to carry a device of their own, such as glasses (Huddleston et al., 2018). These studies analyze the influence of environmental factors (associated with the top-down factors) on consumer choices in actual buying situations involving various factors, including: number and position of shelf facings (Chandon 2009), package design elements (Clement et al., 2013), merchandise displays (Huddleston et al., 2015) and mobile phone usage (Grewal et al., 2018). However, these studies do not provide evidence of the influence of human bodily movement on the process of capturing visual attention. As a result of this, differences in cognitive processing are not measured when consumers are stationary or engaged in bodily movement.

This paper evaluates the relationship between bodily movement and visual attention when consumers choose products in-store: it distinguishes possible retail environment influencers, associated with stimuli in the supermarket, from factors specific to individual consumers. The resulting perspective of this paper holds that cognitive processes stimulated by vision are deeply embedded in the body's interaction with the particular retail environment. As such, this research offers three key contributions: 1) it provides empirical evidence of the influence of bodily movement on the cognitive processing of retail information, 2) it offers novel insights into retail environment influencers associated with stimuli in the supermarket (such as visual complexity, human density, spatial density and shelf layout) and also into factors that vary according to individual consumer (such as time spent in store, the influence of

* Corresponding author.
*E-mail address:* wladeira@unisinos.br (W.J. Ladeira).

https://doi.org/10.1016/j.jretconser.2020.102403
Received 9 December 2019; Received in revised form 12 November 2020; Accepted 21 November 2020


Please cite this article as: Wagner Junior Ladeira, *Journal of Retailing and Consumer Services*, https://doi.org/10.1016/j.jretconser.2020.102403

customer copresence, mobile phone usage and the specific shopping goal) and 3) it demonstrates the importance of not neglecting our comprehension of the effects of bodily movement on retail choices.

## 2. Theoretical background and hypothesis development

There has been a growing interest in the role of bodily movement in human cognition in regard to the experience of consumer judgment and decision-making (Herbert and Pollatos, 2012; Krishna and Schwarz, 2014). This is because neural resources are directly connected with perceptual and motoric processing (Wilson 2002). Physiologically, it has been shown that “higher mental processes” originate in the bodily experience because they reuse phylogenetically older neural circuitry (Krishna and Schwarz 2014). Thus, one may realize that cognitive processes arise from the body’s interactions with the world (Wilson 2002).

The proposal for our paper is based on offline cognition. This approach to cognitive science presupposes the body’s interactions to be a central agent in the formation of the mind, because mechanisms of sensory processing and motor control are essential for capturing environmental information (Wilson 2002). The bodily provenance of motor processes should be seen, therefore, as a crucial component for understanding consumer experiences (Topolinski 2010).

The cognitive processing in this paper will be assessed with respect to visual attention using similar methods to those deployed in several other works in the literature of retail (Chandon 2009; Huddleston et al., 2015; Grewal et al., 2018). In studies of visual attention, it is possible to observe the relationship between bodily movement and gaze behavior (Hollands et al., 2004; Al-Rahayfeh and Faezipour 2013). In the simple act of walking, correlations were found between trunk, head and eye movements. These correlations demonstrate that simply seeing something requires the movement of other bodily parts (Hollands et al., 2004). This is because bodily movement is a natural way of directing attention to objects and regularly accompanies attempts to interact and communicate (Al-Rahayfeh and Faezipour 2013). In the retail environment, there are obviously places where consumers are relatively immobile - such as the checkout line - and other places where consumers are in constant motion, such as when traversing the parallel aisles (Grewal et al., 2018). Therefore, it is expected that:

**H1**. Bodily movement can influence visual attention at the point when consumers are choosing products at the front of a shelf.

## 3. Supermarket stimuli as possible moderators of choice

The number of available products to choose from is capable of impacting purchasing decisions (Diehl 2005, Chernev et al., 2015). The range of product options influences the assortment size on choice overload (Orth and Crouch 2014). A display with many available products will require more complex decision-taking because consumers need more time and additional information to compare options (Chernev et al., 2015).

The visual complexity that can be generated by the extent of retail choice can impact a product’s attractiveness, influence the direction of visual attention to a particular product and also impact processing fluency (Orth and Crouch 2014). In general, visually complex displays tend to require greater effort - and more time - to process (Reber 2004; Pieters et al., 2010; Orth and Crouch 2014). Thus, it is expected that:

**H2a**. Visual complexity will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

Consumers are able to perform a subjective assessment of retail space (Tse et al., 2002; Metha 2013). This phenomenon is known, in the retail literature, as perception of crowding (Machleit et al., 2000). The perception of crowding is made through a consumer’s perception of two interrelated densities: human and spatial (Metha 2013). A perceived human density is the respondents’ assessment of the number of shoppers; a perceived spatial density is the respondents’ assessment of the space available to the shoppers (Machleit et al., 2000; Metha 2013).

A conservative estimation of these two densities can generate discomfort for all consumers (Mehta 2013). In some cases, the perception of crowding tends to evoke negative emotions (Machleit et al., 2000). The perception of crowding occurs at multiple stages in the visual hierarchy. Crowding sets a fundamental limit on conscious visual perception and may reduce the possibility of recognition throughout most of the visual field (Whitney and Levi 2011). Crowding is an effect of insufficient spatial resolution of attention (Poder 2006). Therefore, it can be expected that:

**H2b**. The consumer’s perception of human density will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

**H2c**. The consumer’s perception of spatial density will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

Several studies state that the effectiveness of a supermarket’s layout is determined by various features (such as the middle aisle, the parallel aisles and the customer service points) (Sorensen et al., 2017; Caruso et al., 2018; Grewal et al., 2018; Page et al., 2019). Differences between contrasting supermarket layouts can lead to differences in behaviors, such as the amount (in terms of both items and dollars) of the groceries purchased, shopping trip duration and impulse buying behaviors (Page et al., 2019).

The different layout of a supermarket can also influence visual attention. For example, places where fresh food (fruits and vegetables) are sold usually offer more space, enabling the consumer to traverse these aisles more slowly, thus generating greater visual attention (Grewal et al., 2018). Indeed, supermarkets with a middle aisle allow, by manipulating the visual field, the possibility for the consumer to alter the course of their journey through the store. In such cases, increased accessibility can result in a more cognitive - and therefore less efficient and enjoyable - shopping experience (Page et al., 2019). Another pertinent example is of displays located in front of stores. Navigating these spaces, consumers do not feel trapped and this allows them to focus more freely on the products and promotions offered (Grewal et al., 2018). Considering the significance of the differences in the layout of various departments within a supermarket, one might expect that:

**H2d**. Shelf layout will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

## 4. Factors specific to individual consumers as possible moderators

Temporality is an important dimension in consumer life because consumer experiences happen in a particular temporal flow (Shove et al., 2009; Woermann and Rokka 2015). In retail, the phenomenon of temporality is commonly recognized (Inman et al., 2009). Many consumers tend to be dissatisfied if they imagine they have spent more time in the buying environment than they had planned for (Grewal et al., 2018).

Time spent in a store is a quantitative variable that can influence behavioral attitudes (Grewal et al., 2018). Time spent in a store is directly associated with attentional levels in a retail environment (Inman et al., 2009; Grewal et al., 2018). For example, distraction can lead to increased purchases because consumers spend more time examining products, promotions and comparing shelf prices in the store (Grewal et al., 2018). Therefore, it is expected that:

**H3a**. The time spent in store will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

In the retail environment, it is common for consumers to share and interact with other customers (Colm et al., 2017). Social interaction can lead to other people's intervention in the process of buying and choosing products or services (Argo et al., 2005). Social interaction can occur by consumer's sharing their perceptions of products in the buying environment (Orth and Crouch 2014). The perceptions of others in the retail context can be cognitively expressed in relation to several dimensions, including physical aspects, the level of similarity and the behavioral adequacy of others (Brocato et al., 2012).

Regarding visual attention, the cognitive aspect of social interaction is based on the assumption that the dispersion of human attention dilutes the visual attention that can be directed toward a specific product or object of focus (Risko and Kingstone 2011). Realizing the customer copresence influence - as people are unable to selectively attend to specific product features because other individuals have caught their attention, thereby interrupting their cognitive processing (Richler et al., 2008; Orth and Crouch 2014) - it is thus expected that:

**H3b.** The customer copresence influence will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

Retail research has pointed out that the use of mobile devices can influence consumer buying (Shankar et al., 2016). These studies have indicated that cell phone usage can both positively (Inman et al., 2009) and negatively (Bellini and Aiolfi 2017) influence shopping behavior. The positive aspects are associated with the facilities, provided in the retail environment, to enable mobile phone usage, such as coupon exchanges and viewing promotions (Inman et al., 2009; Bues et al., 2017). On the other hand, negative effects are associated with reduced perceptions of the shopping environment and non-compliance with shopping goals (Atalay et al., 2017). Furthermore, mobile phone usage in the retail environment has been shown to be an important factor in capturing visual attention. The use of mobile phones can be distracting and thus can cause changes in the purchasing routine (Grewal et al., 2018). Therefore, it is expected that:

**H3c.** Mobile phone usage will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

The specific shopping goal is an important factor in determining retail product choice (Orth and Crouch 2014; Wästlund et al., 2015; Grewal et al., 2018). Viewing behavior has been shown to differ considerably, depending on whether the shopping expedition was planned or unplanned (Wästlund et al., 2015). Consumers go to the shops with specific goals in mind, i.e., to buy planned items (Orth and Crouch 2014). Shopping goals keep consumers on track, in terms of both time-taken and money spent (Grewal et al., 2018).

On the other hand, unplanned purchases generate uncertainties and further extend gaze distribution across several different product types (Inman et al., 2009, Wästlund et al., 2015). Therefore, it can be expected that:

**H3d.** The presence of a shopping goal will moderate the relationship between bodily motor actions and visual attention when consumers choose products at the front of a shelf.

## 5. Method

This study used eye-tracking equipment in a supermarket to explore the gaze behavior exhibited by customers choosing products at the front of a display. This field experiment was conducted with real-life data, gathered from actual consumers at a supermarket offering more than 10,000 different stock-keeping units over an area of approximately 75,500 square feet. The floor plan, illustrating the various departments of the supermarket, is shown in Fig. 1.

The 83 recruited participants were asked to shop as normal. However, the final sample comprised only 65 participants (with an average age of 38.15 and 52.3% of who were women) who had their eye-tracking data analyzed. The reduction occurred because problems arose (dead batteries in the eye-trackers and faulty eye-tracking recordings) during the collection of the data of 18 participants. The research was a quasi-experimental study of subjects making a total of 392 choices (an average of 6.03 choices made by each participant) divided into two groups divided according to bodily motor actions: moving body (accounting for 52.3% of the choices) and stationary body (accounting for 47.7% of the choices).

To collect the visual attention data and investigate the related cognitive processes, an eye-tracking system, equipped with a 100-Hz sampling frequency (Tobii Pro Glasses 2 wearable eye-tracker) was used. These eye-tracking procedures monitoring actual shoppers are

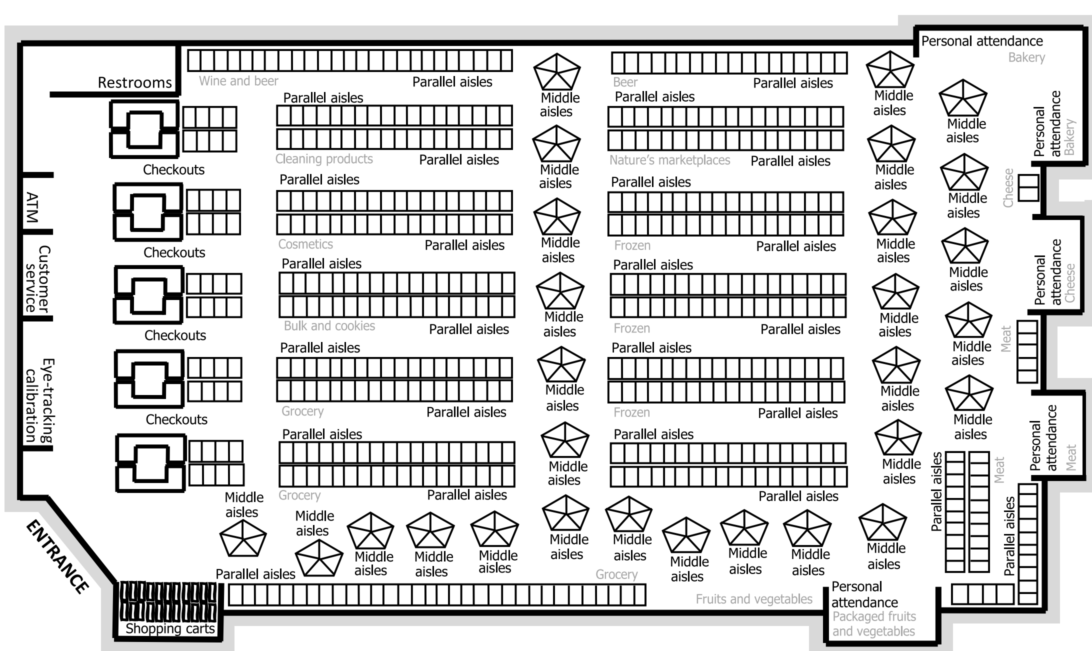


**Fig. 1.** The floor plan with all sectors of the supermarket.

similar to other methods used in other retail studies (Wästlund et al., 2015; Grewal et al., 2018). Three research assistants were positioned near the entrance to the supermarket (see Fig. 1) on different days of the week during opening hours (8:00 a.m.–9:00 p.m.). Consumers entering the supermarket were invited to participate in the survey in exchange for a coupon for a basket draw. Participants who volunteered to take part in the survey received general information on the eye-tracking glasses and soon after a short calibration routine was conducted, which lasted an average of 5 s. The results were recorded in a total of 12 h of video. Different departments of the supermarket were classified according to area of interest (AOIs). The three research assistants were tasked with coding the dataset to establish the number of observations in these AOIs.

The dependent variable was the number of fixations that participants had on each AOI. One observation was counted when a participant viewed one AOI to choose a product. The independent variable has been dichotomized into two possibilities: stationary body or moving body. Stationary body was recorded when consumers exhibited no bodily motor actions in front of a display. On the other hand, bodily movement was recorded when consumers displayed some bodily motor actions (in their legs, arms and trunk) at the front of a shelf.

The moderating variables associated with stimuli in the supermarket were divided into four subsets. The visual complexity of the surrounding context was defined in terms of the assortment size on choice overload (or the number of products on display). Human density was defined according to the number of people who were on the consumer's scan-path, as recorded by the eye-tracker. The spatial density was measured in terms of the distance in meters that the consumer walked in order to make their choice. Shelf layout was divided into three areas, as shown in Fig. 1: customer service points, parallel aisles and middle aisles. The moderating variables associated with the individual aspects relating to each consumer were divided into four groups. The time spent in store is the total time spent in the supermarket. The customer copresence referred to the presence of someone (such as a child, boyfriend, girlfriend, husband, wife, colleague or friend) at the time they made their purchase. The mobile phone usage was measured by the presence, or absence, of the mobile phone at the time of purchase (for example, using the phone for sending messages, following social networks, calling someone or searching for information). The shopping goal was classified as either unplanned purchasing or planned purchasing. This information was obtained by questioning each participant at the end of the data collection process.

In this study, we have measured several possible moderators to test the main processes and alternative paths. The analyzes use the bootstrap procedure suggested by Hayes (2017) and ANOVA. All the analyzes presented in this section use the Hayes (2017) macro for SPSS® and 5000 bootstrapped samples. In the bootstrapping procedure, the effect is significant when the confidence interval excludes zero (Hayes 2017).

## 6. Results

Hypothesis 1 predicted that bodily movement can influence visual attention. Our results indicate that higher levels of visual attention are associated with moments in which the body is stationary; lower levels, conversely, are associated with bodily movement, thus supporting H1. The results of ANOVA indicated a significant main effect of bodily movement on visual attention (F (1,358) = 14,794; p = .000142). The stationary body had more fixations than the moving body when consumers chose products at the front of a shelf (M *Stationary* = 35.1371; SD *Stationary* = 35.2055 vs. M *Movement* = 22.7055; SD *Movement* = 23.6528).

In order to show the influence of stimuli in the supermarket on the relationship between bodily movement and visual attention, Fig. 2a, b, 2c and 2d were created. The hypothesis H2a analyzes the relationship between bodily motor actions and visual attention moderated by a context of visual complexity (Model 1 - Hayes 2017). The results confirm that visual complexity indeed has a moderating impact. The extent of product availability was not significant (β = 6.82; IC95%: = −1.24 to 14.9; p = ns). The bootstrap analysis shows that the indirect effect of the relationship between bodily motor actions and visual attention, moderated by the visual complexity context, was significant for both medium product availability (β = −12.35; IC95%: = −17.997 to −6.718; p < .01) and high product availability (β = −35.97; IC95%: = −43.664 to −28.281; p < .01), thus supporting H2a .

In relation to hypothesis H2b, the results support the moderating influence of human density. The bootstrap analysis shows that the indirect effect of the relationship between bodily motor actions and visual attention, moderated by the human density, was significant for low human density (β = −19.19; IC95%: = −28.729 to −9.656; p < .01) and

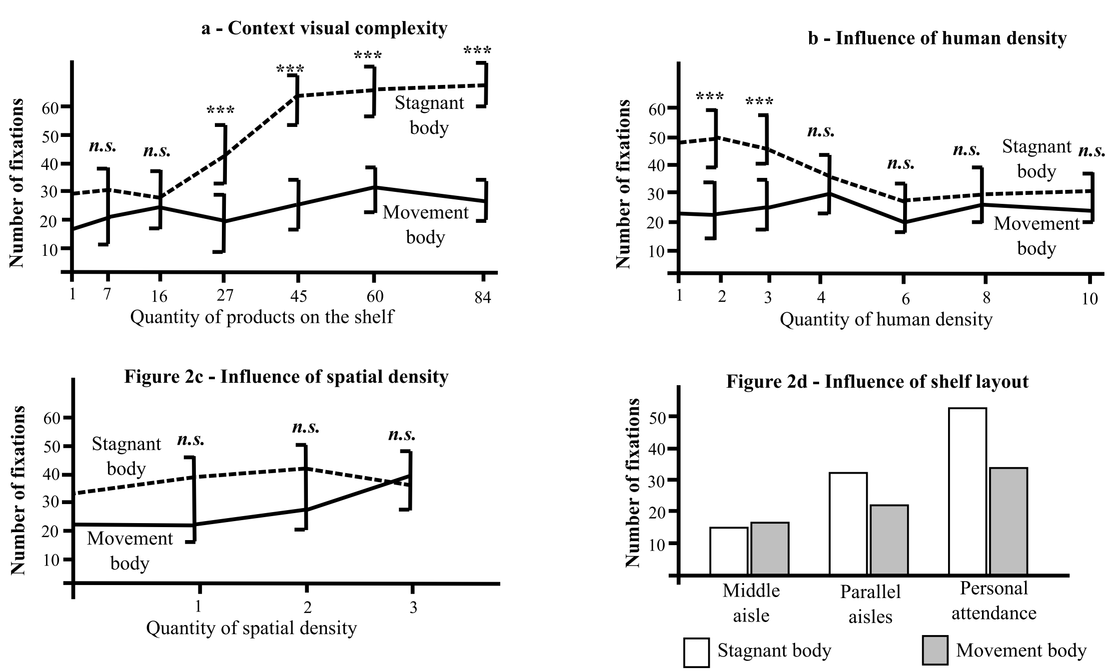


**Fig. 2.** The moderating variables associated with stimuli in the supermarket.

medium human density (β = −13.16; IC95%: = −19.465 to −6.864; p < .01). High human density was not significant (β = −4.12; IC95%: = −14.25 to 6.014; p = ns).

The results do not support the H2c hypothesis. The bootstrap analysis shows that the effect was not significant in terms of the influence of spatial density (β = −18.3509; p = *ns*).

Hypothesis H2d tested the moderating effect of shelf layout on the relationship between bodily motor actions and visual attention. Fig. 2d shows significant differences between the middle aisle, the parallel aisles and the customer service points when consumers are experiencing bodily movement (F (2,186) = 3.77625; p < .05) or displaying a stationary body (F (2,186) = 13.40207; p < .001). With respect to the middle aisle, the ANOVA indicated no significant differences in the number of fixations (F (1,57) = 0.30636; p = .582086; M *Stationary* = 15.2581; SD *Stationary* = 12.1298 vs. M *Movement* = 21.7565; SD *Movement* = 19.1699). Analysis of the difference between bodily movement and a stationary body in the parallel aisles showed a significant difference in the number of fixations (F (1,221) = 10.62641; p = .001291; M *Stationary* = 34.2037; SD *Stationary* = 35.8561 vs. M *Movement* = 21.7565; SD *Movement* = 19.1699). With respect to the customer service points, the ANOVA indicated significant differences in the frequency of fixations (F (1,71) = 4.30344; p = .041662; M *Stationary* = 53.94; SD *Stationary* = 36.2876 vs. M *Movement* = 34.5652; SD *Movement* = 38.7543).

In order to show the moderating influence of individual consumer-related factors on the relationship between bodily movement and visual attention, Fig. 3a, b, c and d were created. The results do not support the H3a hypothesis. The bootstrap analysis shows that the effect was not significant for the time spent in store (seconds) (β = −15.731; p = *ns*).

In hypothesis H3b, the results support the moderating influence of customer copresence. The bootstrap analysis shows that the indirect effect of the relationship between bodily motor actions and visual attention, moderated by the customer copresence, was significant for the low levels (β = −20.06; IC95%: = −28.3702 to −11.763; p < .01) and also the high levels of customer copresence (β = −7.13; IC95%: = −14.041 to −0.234; p < .01).

Hypothesis H3c tested the moderating effect of mobile phone usage on the relationship between bodily motor actions and visual attention. Fig. 3c shows significant differences between the absence and presence of mobile phone use when consumers experience bodily movement (F (1,161) = 6.09257; p < .05) and a stationary body (F (1,194) = 4.09107; p < .05). With respect to presence of mobile phone use, the ANOVA indicated significant differences in the number of fixations (F (1,205) = 9.30307; p = .00259; M *Stationary* = 31.3739; SD *Stationary* = 37.3378vs. M *Movement* = 18.75; SD *Movement* = 15.0301). Analysis of the difference between bodily movement and a stationary body, in the absence of mobile phone use, showed a significant difference in the number of fixations (F (1,151) = 6.19555; p = .013892; M *Stationary* = 40.4146; SD *Stationary* = 31.4438 vs. M *Movement* = 27.831; SD *Movement* = 30.8846).

Finally, the results partially supported the moderating impact of a shopping goal. Fig. 3c shows significant differences between unplanned purchasing and planned purchasing when consumers experience bodily movement (F (1,161) = 5.19344; p < .05) and a stationary body (F (1,195) = 16.75439; p < .01). With respect to unplanned purchased, the ANOVA indicated significant differences in the number of fixations (F (1,88) = 27.15947; p = .00001; M *Stationary* = 55.3421; SD *Stationary* = 51.8654 vs. M *Movement* = 16.6154; SD *Movement* = 11.849). Analysis of the difference between bodily movement and a stationary body in planned purchasing did not show a significant difference in the number of fixations (F (1,268) = 1.92951; p = .165966; M *Stationary* = 30.3082; SD *Stationary* = 28.0343 vs. M *Movement* = 25.5586; SD *Movement* = 27.0755).

## 7. Discussion

### *7.1. Theoretical implications*

To expand our knowledge of the significance of the level of attention and the cognitive processing that occurs at the front of a shelf in retail, we have investigated how bodily motor actions influence visual attention. This study summarizes initial insights from extant literature pertaining to bodily movement and human cognition; additionally, it differentiates the influence of various moderators associated with stimuli in the supermarket and individual factors relating to each specific consumer. Results reveal that the amount of information absorbed by gaze behavior is conditioned by the presence - "*versus*" the absence - of bodily movement at the time of product selection at the front of a shelf.

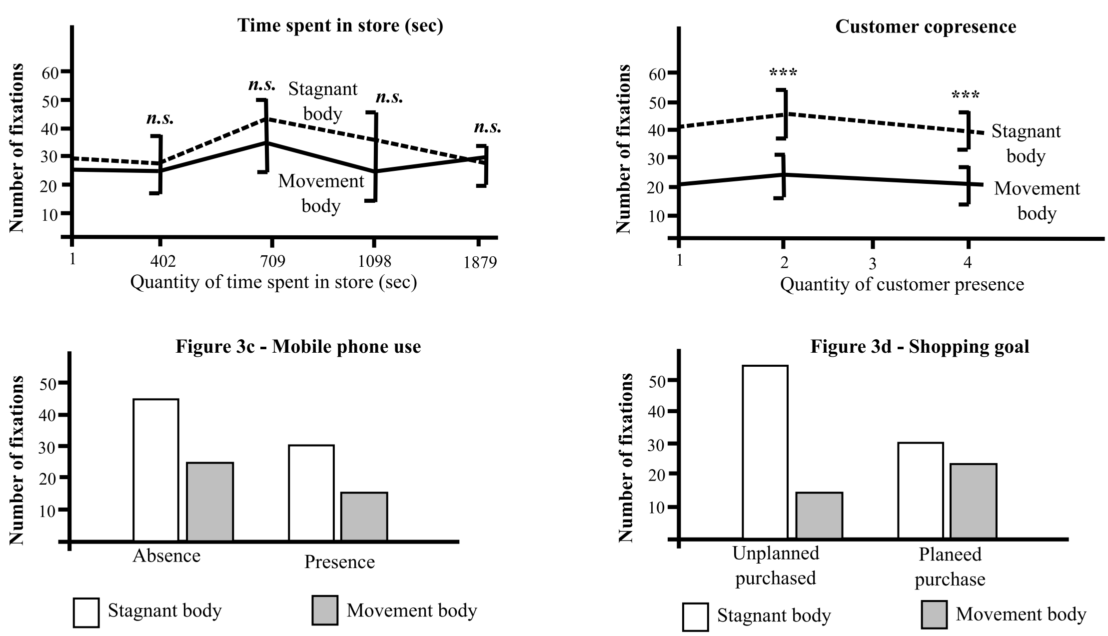


**Fig. 3.** The moderating variables associated with consumer own aspects.

Results demonstrate that bodily movement reduces the number of fixations of visual attention. In contrast, consumers who choose products whilst their body is stationary tend to experience a higher number of fixations. If eye movements and fixation durations are affected by the cognitive processes - as seminal studies indicate (Justin and Carpenter 1976; Rayner 1977) - it can be inferred that, when consumers are stationary a greater degree of cognitive processing takes place; conversely, when they are moving, there is less.

Much of the extant literature on attention levels at the front of a shelf, in the retail environment has examined the number of fixations (Chandon et al., 2009; Clement et al., 2013; Grewal et al., 2018). As shown in these surveys, perceptions of the consumption experience are influenced by gaze behavior. This research indicates that these consumption experiences may depend directly on bodily movement, since the number of fixations is conditioned by bodily motor actions. We have indicated seven possible situations (moderators) that can alter these consumer experiences in relation to bodily movement.

First, it was found that the impact of bodily movement on gaze behavior can be conditioned by the complexity of the visual context. This can be explained by the fact that more complex scenes require greater effort in order to capture the data (Reber 2004; Orth and Crouch 2014). For shelves containing small quantities of goods, where consumer decisions were taken regarding product selection, the fixation patterns were similar for both stationary and moving bodies. However, with the growing tendency to increase visual complexity at the front of a shelf, the stationary body is better able to internalize more visual information for the brain to process than the body in a state of movement. This can be explained by the fact that more complex scenes require greater effort to absorb the data.

Human density and customer copresence have been shown to be two factors that can moderate the impact of bodily motor action on visual attention. These two factors corroborate studies that indicate that social presence can interfere with consumer experiences (Richler et al., 2008; Orth and Crouch, 2014). For this specific study, the influence of human density did not differ when there were just a few people in the retail environment. When conditioned to have a small number of people around them, consumers who are stationary can absorb more information through fixations than consumers who are moving. When exposed to a higher human density, the consumer who is standing still tends to reduce their number of fixations. It can be assumed, therefore, that increasing the amount people can divert consumer's attention away from their buying goals. In the retail literature of crowding, human density can elicit reactions associated with negative feelings and unpleasant experiences (Machleit et al., 2000; Metha 2013). In this case, we believe that bodily movement can be increased in situations of high human density, thereby lowering attention levels and consequently increasing the likelihood that the consumer will perceive negative feelings and unpleasant experiences.

In the same vein, customer copresence influences the relationship between bodily motor actions and visual attention. In the case of this variable, moderation was significant for any number of people. The presence of another (child, boyfriend, girlfriend, husband, wife, colleague or friend) at the time of the purchase causes fewer fixations when the body is moving, thus reducing visual attention. It can be assumed, therefore, that this presence reduces the amount of absorbed information, as a high level of diversionary attention is associated with copresence.

These findings also suggest that shelf layout may influence bodily movements. Unlike other departments in the supermarket, the middle aisle is able to make moving customers intake the same amount of information as those who are stationary. This type of location is a strategic point at which retailers tend to drive immediate consumption through promotions (Page et al., 2019). You can therefore assume that these locations strongly interconnect to other areas of the supermarket and are, thus, an inconvenient place for the consumer to stand still. In the parallel aisle and at the customer service points, it has been shown that there is a difference in the attention levels of consumers: people who are stationary have more fixations than people who are moving in these areas, possibly because they are places where purchasers enjoy more time to make their choices without disrupting other consumers.

Two other possible factors that influence bodily motor actions - and consequently visual attention - are mobile phone usage and the existence of a shopping goal. Using a mobile phone reduces the attention level of both those who are moving and those who are stationary. In addition, the results showed that people who use a cell phone while they are standing still display fixation patterns similar to others who are moving yet not using a phone. These findings may help explain gaps in mobile phone usage in retail stores (Grewal et al., 2018).

Finally, those consumers with a shopping goal, selecting products whilst moving, who were shopping for unplanned purchases generated the lowest levels of attention. In contrast, unplanned purchases made while the body was stationary generated the highest attention levels. These results may indicate that, when making unplanned purchases, the consumer needs a higher level of concentration, independent of their bodily motor actions. In the case of planned purchasing, bodily motor actions have not been shown to influence the number of fixations. Based on this result, it can be assumed that bodily movement can alter attention levels significantly during the making of unplanned purchases, but not during planned purchasing.

### 7.2. Practical implications

Given that bodily motor actions play an essential role in influencing visual attention, the current findings have important practical implications for both marketing practitioners and consumers. From a managerial perspective, marketing efforts could consider that shelves that contain a complex array of visual content, displaying an assortment of many products, can reduce the visual attention of shoppers in a hurried or agitated state. In addition, our results underscore that crowded places can reduce attentiveness, even in people who have a habit of making buying decisions whilst their body is stationary. From a consumer's perspective, our results suggest that they can maximize their attentiveness by reducing bodily movement and cellphone usage whilst shopping. The empirical findings suggest that consumers should exercise caution when they are in specific supermarket locations - such as parallel aisles and customer service areas - that moderate visual attention whilst their body is moving.

### 7.3. Limitations and future research

Our research suffers several limitations that we should consider. First, the cognitive processing analyzed in this paper has as its source only the data concerning visual attention that was generated in the Fovea region. Accordingly, these results do not express cognitive processing information generated by physiological, electroencephalographic and functional measurements of infrared spectroscopy. Finally, most of our findings are difficult to reconcile with theoretical models of decision-making. The limitations indicated here should inform the design of future research studies. We suggest using neuroscience hardware and software (such as facial expression analysis, galvanic skin response, EEG and fNIRS) to better understand the effect of body motor actions on cognitive processing.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jretconser.2020.102403.

## References

Al-Rahayfeh, A., Faezipour, M., 2013. Eye tracking and head movement detection: a state-of-art survey. IEEE journal of translational engineering in health and medicine 1.

Argo, J.J., Dahl, D.W., Manchanda, R.V., 2005. The influence of a mere social presence in a retail context. J. Consum. Res. 32 (2), 207–212.

Atalay, A.S., Bodur, H.O., Bressoud, E., 2017. When and how multitasking impacts consumer shopping decisions. J. Retailing 93 (2), 187–200.

Bellini, S., Aiolfi, S., 2017. The impact of mobile device use on shopper behaviour in store: an empirical research on grocery retailing. Int. Bus. Res. 10 (4), 58–68.

Brocato, E.D., Voorhees, C.M., Baker, J., 2012. Understanding the influence of cues from other customers in the service experience: a scale development and validation. J. Retailing 88 (3), 384–398.

Bues, M., Steiner, M., Stafflage, M., Krafft, M., 2017. How mobile in-store advertising influences purchase intention: value drivers and mediating effects from a consumer perspective. Psychol. Market. 34 (2), 157–174.

Caruso, W., Corsi, A.M., Bogomolova, S., Cohen, J., Sharp, A., Lockshin, L., Tan, P.J., 2018. The real estate value of supermarket endcaps: why location in-store matters. J. Advert. Res. 58 (2), 177–188.

Chandon, P., Hutchinson, J.W., Bradlow, E.T., Young, S.H., 2009. Does in-store marketing work? Effects of the number and position of shelf facings on brand attention and evaluation at the point of purchase. J. Market. 73 (6), 1–17.

Chernev, Alexander, Böckenholt, Ulf, Goodman, Joseph, 2015. Choice overload: a conceptual review and meta-analysis. J. Consum. Psychol. 25 (2), 333–358.

Clement, J., Kristensen, T., Grønhaug, K., 2013. Understanding consumers' in-store visual perception: the influence of package design features on visual attention. J. Retailing Consum. Serv. 20 (2), 234–239.

Colm, L., Ordanini, A., Parasuraman, A., 2017. When service customers do not consume in isolation: a typology of customer copresence influence modes (CCIMs). J. Serv. Res. 20 (3), 223–239.

Diehl, Kristin, 2005. When two rights make a wrong: searching too much in ordered environments. J. Market. Res. 42 (3), 313–322.

Grewal, D., Ahlbom, C.P., Beitelspacher, L., Noble, S.M., Nordfält, J., 2018. In-store mobile phone use and customer shopping behavior: evidence from the field. J. Market. 82, 102–126.

Hayes, A.F., 2017. Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. Guilford Publications.

Herbert, B.M., Pollatos, O., 2012. The body in the mind: on the relationship between interoception and embodiment. Top. Cognit. Sci. 4 (4), 692–704.

Hollands, M.A., Ziavra, N.V., Bronstein, A.M., 2004. A new paradigm to investigate the roles of head and eye movements in the coordination of whole-body movements. Exp. Brain Res. 154 (2), 261–266.

Huddleston, P., Behe, B.K., Minahan, S., Fernandez, R.T., 2015. Seeking attention: an eye tracking study of in-store merchandise displays. Int. J. Retail Distrib. Manag. 43 (6), 561–574.

Huddleston, P.T., Behe, B.K., Driesener, C., Minahan, S., 2018. Inside-outside: using eye-tracking to investigate search-choice processes in the retail environment. J. Retailing Consum. Serv. 43, 85–93.

Inman, J.J., Winer, R.S., Ferraro, R., 2009. The interplay among category characteristics, customer characteristics, and customer activities on in-store decision making. J. Market. 73 (5), 19–29.

Just, M.A., Carpenter, P.A., 1976. Eye fixations and cognitive processes. Cognit. Psychol. 8 (4), 441–480.

Krishna, A., Schwarz, N., 2014. Sensory marketing, embodiment, and grounded cognition: a review and introduction. J. Consum. Psychol. 24 (2), 159–168.

Machleit, K.A., Eroglu, S.A., Mantel, S.P., 2000. Perceived retail crowding and shopping satisfaction: what modifies this relationship? J. Consum. Psychol. 9 (1), 29–42.

Mehta, R., 2013. Understanding perceived retail crowding: a critical review and research agenda. J. Retailing Consum. Serv. 20 (6), 642–649.

Orth, Ulrich R., Crouch, Roberta C., 2014. Is beauty in the aisles of the retailer? Package processing in visually complex contexts. J. Retailing 90 (4), 524–537.

Page, B., Trinh, G., Bogomolova, S., 2019. Comparing two supermarket layouts: the effect of a middle aisle on basket size, spend, trip duration and endcap use. J. Retailing Consum. Serv. 47, 49–56.

Pieters, R., Wedel, M., Batra, R., 2010. The stopping power of advertising: measures and effects of visual complexity. J. Market. 74 (5), 48–60.

Poder, Endel, 2006. "Crowding, feature integration, and two kinds of "attention". J. Vis. 6 (2), 7–15.

Rayner, K., 1977. Visual attention in reading: eye movements reflect cognitive processes. Mem. Cognit. 5 (4), 443–448.

Reber, Rolf, Schwarz, Norbert, Winkielman, Piotr, 2004. Processing fluency and aesthetic pleasure: is beauty in the perceiver's processing experience? Pers. Soc. Psychol. Rev. 8 (4), 364–382.

Reimann, M., Bechara, A., 2010. The somatic marker framework as a neurological theory of decision-making: review, conceptual comparisons, and future neuroeconomics research. J. Econ. Psychol. 31 (5), 767–776.

Richler, J.J., Tanaka, J.W., Brown, D.D., Gauthier, I., 2008. Why does selective attention to parts fail in face processing? J. Exp. Psychol. Learn. Mem. Cognit. 34 (6), 1356.

Risko, E.F., Kingstone, A., 2011. Eyes wide shut: implied social presence, eye tracking and attention. Atten. Percept. Psychophys. 73 (2), 291–296.

Shankar, V., Kleijnen, M., Ramanathan, S., Rizley, R., Holland, S., Morrissey, S., 2016. Mobile shopper marketing: key issues, current insights, and future research avenues. J. Interact. Market. 34, 37–48.

Shove, E., Trentmann, F., Wilk, R. (Eds.), 2009. Time, Consumption and Everyday Life: Practice, Materiality and Culture. Berg.

Sorensen, H., Bogomolova, S., Anderson, K., Trinh, G., Sharp, A., Kennedy, R., Wright, M., 2017. Fundamental patterns of in-store shopper behavior. J. Retailing Consum. Serv. 37, 182–194.

Topolinski, S., 2010. Moving the eye of the beholder: motor components in vision determine aesthetic preference. Psychol. Sci. 21 (9), 1220–1224.

Tse, A.C.B., Sin, L., Yim, F.H., 2002. How a crowded restaurant affects consumers' attribution behavior. Int. J. Hospit. Manag. 21 (4), 449–454.

Wästlund, E., Otterbring, T., Gustafsson, A., Shams, P., 2015. Heuristics and resource depletion: eye-tracking customers' in situ gaze behavior in the field. J. Bus. Res. 68 (1), 95–101.

Whitney, David, Levi, Dennis M., 2011. Visual crowding: a fundamental limit on conscious perception and object recognition. Trends Cognit. Sci. 15 (4), 160–168.

Wilson, M., 2002. Six views of embodied cognition. Psychonomic Bull. Rev. 9 (4), 625–636.

Woermann, N., Rokka, J., 2015. Timeflow: how consumption practices shape consumers' temporal experiences. J. Consum. Res. 41 (6), 1486–1508.