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Cognitive Age and Grocery Store Patronage by Elderly Shoppers

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Abstract

This paper discusses and evaluates the impact of cognitive (or self-perceived) age on grocery store patronage by elderly shoppers. Cognitive age is seen to be a more accurate reflection of changes related to age and aging than chronological age. Based on self-concept theory, the authors propose that cognitive age moderates the effects of perceptions of store attributes on satisfaction with a store. The hypotheses tests used a sample of 404 supermarket patrons aged 60 and above. The latent construct, cognitive age, was operationalised by six items: feel, look, do, interest, health and think age. The cognitive ages of our respondents proved to be significantly lower than their chronological ages. To evaluate the moderating effects, we applied the product indicator approach using variance-based structural equation modelling. The results show that the impacts of product range, manoeuvrability and atmosphere within the store on satisfaction become significantly stronger with increasing cognitive age. We conclude that cognitive age dimensions influence perceptions and, subsequently, behaviour related to store patronage and thus contribute to the understanding of the growing segment of elderly shoppers.

Summary statement of contribution: The contribution of this paper is to provide a theoretical rationale and empirical evidence for considering cognitive age as a substantial influencer and predictor of store patronage by elderly shoppers. Thus, we call for a stronger consideration of self-perceived age dimensions, along with chronological age, in research and marketing related to older consumer cohorts.

Keywords: Cognitive age, grocery, consumer, senior citizen, retail, patronage;

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Introduction

Moschis and Mathur (1993, p. 42) emphasised that people ‘age differently and at different rates’ and this is reflected in their behaviour. Chronological age, that is the number of years a person has lived (Barak and Gould, 1985), is limited in terms of understanding and accounting for heterogeneity in older consumer markets. Consequently, marketing and consumer behaviour researchers have investigated the impact of self-perceived or cognitive age as a surrogate for chronological age when looking at various aspects of consumer behaviour (Sudbury & Simcock, 2009). Cognitive age is arguably a more accurate predictor of people’s attitudes, beliefs and behaviour than chronological age since it reflects this non-constant rate of aging more accurately (e.g. Moschis & Mathur, 2006; Sherman, Schiffman, & Mathur, 2001). Barak and Schiffman (1981) were the first to introduce the concept of cognitive age in a marketing-related context. Cognitive age refers to ‘an individual’s actual age-role self-concept, reflecting his/her age-identity in terms of four age dimensions’ (Barak & Gould, 1985, p. 53), namely (1) feel age, (2) look age, (3) act/do age and (4) interest age. Clark, Long, and Schiffman (1999) extended the concept and added the dimensions of (5) health age and (6) think age. These six dimensions enable more differentiations to be made between different aspects of age and aging compared to what is possible using chronological age.

Cognitive age is of primary importance for understanding the behaviour of older consumer cohorts (Moschis & Mathur, 2006), who – on average – perceive themselves as younger than they actually are (Kaufman & Elder Jr., 2002; Sherman et al., 2001). In general, older consumers are an increasingly important segment for businesses and retailers, particularly as

the segment grows in terms of numbers and disposable income (Yoon et al., 2005). These consumer cohorts have specific needs and abilities and thus distinctive consumer behaviour (Hare, 2003; Moschis, Curasi, & Bellenger, 2004). The literature has covered fragmented aspects of older consumers' behaviour in relation to cognitive age. Behavioural variables that have been investigated include brand choice and trial, information-seeking behaviour and cautiousness in purchasing (Gwinner & Stephens, 2001; Stephens, 1991), perceived time, time usage and consumption activities (Szmigin & Carrigan, 2000; Szmigin & Carrigan, 2001), consumption orientation (Sherman et al., 2001), responses to pricing and communication/advertising stimuli (Barak & Gould, 1985; Moschis & Mathur, 2006; Sudbury & Simcock, 2009) and TV/media consumption (Johnson, 1993; Smith & Moschis, 1984).

However, the impact of cognitive age on shopping behaviour and store patronage has not received much attention (Teller & Gittenberger, 2011). This is particularly true for grocery shopping – a frequent and challenging (logistical) task in older consumers' lives (Teller, Kotzab, & Grant, 2012; Whelan, Wrigley, Warm, & Cannings, 2002). Nevertheless, older shoppers are an important and growing segment due to the 'greying of market places' (Zeithaml & Gilly, 1987) and are a challenged and disadvantaged consumer group due to changes related to biological, psychological and social aging. Consequently, Pan and Zinkhan (2006) called for a stronger research focus on the question 'Why do older people shop where they do?' The relevance and necessity of looking at cognitive age in the context of older consumers is to understand how changes due to aging (Moschis, 1994) – better reflected by self-perceived age than chronological age – influence perceptions and ultimately behaviour related to store-based shopping. Ultimately, a deeper understanding of age-related changes in store patronage will enable retailers to take the special needs of elderly consumers into account in their marketing and operations (Mason & Bearden, 1979). As such, an in-depth

look into the role of cognitive age in terms of store patronage behaviour could help to overcome a recognised problem in retail management and marketing, that ‘painting all elderly consumers with the same broad brush because of their age eliminates much of their individual complexity and does not allow for meaningful market segmentation’ (Gwinner & Stephens, 2001, p. 1032).

The aim of this paper is to investigate the moderating effect of self-perceived age on the antecedents of store patronage among older consumer cohorts. Thus, we build upon the self-concept theory (e.g. Sirgy, 1982) and the concept of self-perceived age proposed by Barak and Schiffman (1981) as well as a generic store patronage behaviour model derived from the work of Sirohi, McLaughlin, and Wittink (1998) and Szymanski and Henard (2001). The contribution of this paper is that it provides a theoretical rationale and empirical evidence for considering cognitive age as a substantial influencer and predictor of elderly consumers’ perceptions and, consequently, their behaviour related to store-based shopping.

Following these introductory remarks, we will now enlarge on the theoretical foundation of our arguments and, subsequently, set up our hypotheses. Next, the research design of our empirical study will be presented. After this, we provide our model results leading to a discussion of the core findings with respect to the literature. Limitations and a future research agenda conclude the paper.

Theoretical background

Self-concept and cognitive age

The construct of cognitive age and its discrepancy with chronological age is closely related to the self-concept theory (Sirgy, 1982). Rosenberg (1979) refers to the self-concept as the

‘totality of the individual’s thoughts and feelings having reference to himself as an object’ (p. 7). The self-concept is related to the reality that is perceived subjectively – such as in the case of cognitive age – rather than the reality measured objectively such as by chronological age (Barak & Gould, 1985). One of its core characteristics is that it is learned, purposeful, unique to an individual, stable and consistent (e.g. Sirgy, 1982). The last two characteristics imply that people do not change their self-concept significantly, except as a consequence of a change in their environment, an overall behaviour change within their environment, or when they can no longer function in their environment (Crain & Bracken, 1994).

Mathur and Moschis (2005) see the subjectively perceived reality that is reflected by cognitive age as changing at a different and less constant rate – depending on the stability of a person’s environment – than the objectively perceived reality measured by chronological age. They also see the dependency of cognitive age on changes in environment – for example significant events such as illness, retirement, loss of a partner – as a reason why (especially older) people often perceive themselves to be younger than they are (e.g. Sherman et al., 2001). As an outcome of this time-lagged change in self-perception, older people in particular often stick to developed and learned consumption-related behaviour and thus try to retain their self-concept (Moschis & Mathur, 2006). As such, consumers’ ‘perception[s] of their age do not tend to keep pace with their actual age’ (Kaufman & Elder Jr., 2002, p. 175). Further, chronological age represents a limited measure in terms of understanding and predicting a consumer’s perceptions and behaviour since the latter are more closely linked to the consumer’s self-concept and the non-constant changes to it. Furthermore, cognitive age is particularly relevant for elderly consumer cohorts as it takes into account lifetime-related changes in perceptions and behaviour that tend to occur in later life.

Store patronage and elderly consumers

The phenomenon of retail store patronage has received considerable attention in the marketing, consumer behaviour and retailing literature for more than seventy years (see e.g. the seminal works of Reilly (1931) and Huff (1964)). Pan and Zinkhan (2006) presented a meta-analysis comparing and summarising a significant number of academic contributions dealing with the antecedents of retail patronage and related perceptions, attitudes and behaviour. Most of these store patronage studies have been grounded in the stimulus-organism-response (S-O-R) framework (e.g. Finn & Louviere, 1996; Mazursky & Jacoby, 1986; Sherman et al., 2001). This framework is rooted in the work of Mehrabian and Russel (1974), in which a stimulus is posited to lead to an evaluation and emotional reaction, which subsequently informs consumer behaviour (Donovan & Rossiter, 1982).

Within this framework, Sirohi et al. (1998) and Szymanski and Henard (2001) propose a direct relationship between the perception of store attributes (i.e. stimuli) and satisfaction (i.e. response). Satisfaction represents an outcome of post-purchase evaluations in terms of how positively consumers view a store and whether its attributes have met or exceeded their expectations (Oliver, 1980). Furthermore, satisfaction results in patronage intentions and loyalty (Oliver, 1980; Szymanski & Henard, 2001), which ultimately lead to a behavioural outcome related to store patronage (Fornell, 1992; Sirohi et al., 1998). Patronage behaviour is measured by such aspects as the share of spending, share of time and share of visits dedicated to a particular store (Pan & Zinkhan, 2006). Thus, satisfaction is seen as a key variable that reflects the whole shopping experience of a consumer and is consequently a powerful reflection of consumers' store patronage (Szymanski & Henard, 2001). The role satisfaction plays in shopping varies with age, becoming more important for older consumers, who are

generally more engaged in the shopping process than younger consumers (Westbrook & Black, 1985).

Within this context, Teller and Gittenberger (2011) presented a literature review demonstrating that the store patronage of older consumers, and its antecedents, is still under-researched in the marketing, consumer behaviour and retail literature, despite that segment's considerable and growing importance. They also remarked that, even when elderly consumers and their store-related perceptions and behaviour had been at the centre of researchers' interest, little had been done to identify hidden subgroups within the seemingly monolithic block of the elderly. Cognitive age has not been considered at all as a variable that moderates the perceptions and behaviour of store patrons.

Most of the research to date has looked at the patronage behaviour of elderly consumers in the context of grocery retailing. The reason for this focus on shopping for food products is that buying groceries from stores is a necessity – a frequently executed task that involves a considerable amount of physical endeavour, such as transportation, handling, packing, and picking, which can be summarised under the term consumer or shopper logistics (e.g. Granzin & Bahn, 1989; Teller et al., 2012). Obviously, consumer and more specifically shopping logistics is a challenging task for elderly consumers if they are not able to outsource their shopping to another person or have groceries delivered to their homes. Store formats and attributes influence shopper logistics. The literature on elderly consumers mentions, in particular, the following store attributes as determinants of satisfaction with stores and, consequently, of store patronage: accessibility of the store and the products within the store, pricing and product-related attributes, and atmosphere (Hare, Kirk, & Lang, 2001; Keillor, Parker, & Erffmeyer, 1996; Meneely, Burns, & Strugnell, 2008; see appendix for the operationalization of these constructs). Depending on the consumer's age, the role of such

attributes varies so they have different effects on satisfaction with and behaviour related to a (patronised) store (Goodwin & McElwee, 1999; Lumpkin, Greenberg, & Goldstucker, 1985; Moschis et al., 2004).

Hypotheses and conceptual model

Given the considerable explanatory and predictive power of cognitive age with respect to the perceptions and behaviour of elderly consumers, and the necessity to better understand the consumer and shopping behaviour of the elderly, particularly with respect to significant tasks in their daily lives such as grocery shopping, we set up a conceptual model. The model proposes that cognitive age has a moderating role on store patronage by elderly consumers. The embedded hypotheses draw upon the self-concept theory, the concept of cognitive age and the Stimulus-Organism-Response model within the store patronage context. In the model, we focus on the relationship between selected store attributes that are of particular relevance for elderly shoppers and satisfaction with the store. The latter has been considered (1) a determinant of other behavioural variables such as loyalty, spending and retention time, and (2) a suitable predictor of store patronage (e.g. Gómez, McLaughlin, & Wittink, 2004; Mägi, 2003).

For older consumers, the accessibility of a store represents a crucial determinant of store patronage, particularly in the case of grocery shopping (Hare, 2003; Whelan et al., 2002). Accessibility in this sense indicates the convenience of physical access in terms of how easy, quick, problem-free and safe it is to get to stores (e.g. Meneely, Strugnell, & Burns, 2009a; Solgaard & Hansen, 2003). Since personal mobility deteriorates with age, the accessibility of stores becomes more important for older consumer cohorts (Moschis et al., 2004). Another aspect of access relates to the products within the store and includes the effort required to

pick and pack product (Teller et al., 2012). Such in-store accessibility is related to store attributes such as manoeuvrability within the outlet, which has also been considered a driver of store satisfaction and patronage in previous work on shopping by the elderly (Johnson-Hillery & Kang, 1997; Meneely et al., 2008). Manoeuvrability within a store is related to the possibility of efficient and effective movement and navigation, that is, whether shoppers can manoeuvre through the store without problems, whether they can do so safely and quickly, and whether they can easily find the products they are looking for (Titus & Everett, 1995). Personal mobility and cognitive ability play an important role in whether or not elderly shoppers are able to find their way around a store and locate the products they are looking for (Hare et al., 2001).

Like manoeuvrability, the presentation and allocation of products on shelves (*i.e.* shelf management) enable consumers to find and compare products and thus facilitate the shopping process in-store (Teller et al., 2012). Shelf management relates to the clear arrangement of products facilitating the shopper's search, the reachability of products on shelves and the readability of labels and price information (Moschis et al., 2004; Pettigrew, Mizerski, & Donovan, 2005). The whole picking process is more challenging for older consumers (Goodwin & McElwee, 1999). Older shoppers may have difficulty reading labels and getting an overview of the category of products on a particular shelf due to deteriorating eyesight (Hare, 2003) and struggle to reach products on top or bottom shelves due to reduced mobility (Radford-Lewis & Nimbs, 2005).

Nevertheless, the literature that supports the importance of these three antecedents in affecting store satisfaction argues based on chronological age and its moderating effects. Nevertheless, people are also affected by changes related to biological aging, such as the onset of chronic conditions or illness, a reduction of mobility, declining vision and hearing,

differently over their life time (Moschis, 2012). Chronological age does not accurately reflect the changes in the bodily system that result in a decline in abilities and, as such, influence perceptions and consumer behaviour related to stores (Moschis, 1994). Cognitive age reflects (self-perceived) physical and cognitive fitness explicitly and thus takes non-constant changes in self-concept into account (Barak & Gould, 1985). We thus propose that there is a stronger impact (m_n) of accessibility, manoeuvrability and shelf management on the satisfaction of cognitively older age groups, as set out in the following three hypotheses (H_n ; Clark et al., 1999):

H_1 : The higher is a person's cognitive age, the greater is the positive impact of accessibility on store satisfaction.

H_2 : The higher is a person's cognitive age, the greater is the positive impact of manoeuvrability within the grocery store on store satisfaction.

H_3 : The higher is a person's cognitive age, the greater is the positive impact of shelf management in the grocery store on store satisfaction.

Besides accessibility, the two other most frequently investigated determinants of satisfaction are the price-value ratio and the product range of a store (Pan & Zinkhan, 2006). The price-value ratio – a store attribute – comprises dimensions such as the price level, the number of price promotions and the ratio between the price and the quality of products (Moschis et al., 2004; Sirohi et al., 1998). The product range comprises two dimensions – width and depth of the retail offerings of a store. The latter can be further divided into dimensions such as the share of branded and high-quality products (Moschis, 2003; Sirohi et al., 1998).

Older consumer cohorts are characterised as being price- and quality-sensitive (or savvy) and as spending more time comparing the prices and quality of the products in a store (Goodwin & McElwee, 1999; Keillor et al., 1996; Lumpkin et al., 1985; Moschis et al., 2004; Tantiwong & Wilton, 1985). Older consumers appreciate well-known brands due to their greater aversion to purchase-related risks (Moschis, 2003). Overall purchase-related risks include not getting the right product (e.g. if it is not in the range or out of stock) at the right quality, price or package size within a store. Such risks are more frequent in stores that lack consideration of specific needs of elderly consumers in terms of their product offer (e.g. Hare, 2003; Meneely et al., 2008; Meneely, Strugnell, & Burns, 2009b). Stores with a wider and deeper product range reduce such purchase-related risk by giving older consumers more choice in finding products and promotions that satisfy their age related requirements and make it easier to substitute a product in the case of an out-of-assortment and out-of-stock situation at the point of sale (Emmelhainz, Emmelhainz, & Stock, 1991; Ratner, Kahn, & Kahneman, 1999).

The changing role of product and price-related store attributes for elderly consumers reflects changes in their cognition, including memory, intelligence, problem solving and reasoning, and is related to the psychological aspect of aging (Moschis, 2012). Nevertheless, cognition and cognitive abilities do not erode, and risk aversion does not increase, at a constant rate for all consumers as chronological age increases (Cole et al., 2008; Zeithaml & Gilly, 1987). Since cognitive age takes into account such changes that occur over time to a more accurate degree (Moschis, 2012), we propose that it has a moderating effect on the impact of both the price-value ratio and the product range in a retail store on elderly consumers' satisfaction, leading to the next two hypotheses:

H₄: The higher is the cognitive age of a consumer, the greater is the positive impact of the price-value ratio of the products offered in the grocery store on store satisfaction.

H₅: The higher is the cognitive age of a consumer, the greater is the positive impact of the product range offered in the grocery store on store satisfaction.

Overall, elderly shoppers are exposed to the shopping task more than younger shoppers (in terms of shopping trip duration or time spent in an individual store), due to their inferior fitness and agility, or simply due to having more disposable time. As a result, people tend to appreciate pleasant atmospheric stimuli related to lighting, clientele, cleanliness, smell, temperature and the mood in the store more as they get older (Donovan, Rossiter, Marcoolyn, & Nesdale, 1994; Kaapke et al., 2005; Westbrook & Black, 1985). Given that cognitive age indicates changes in the self-concept, such as events related to biological, psychological and social aging, we propose that cognitive age moderates the role atmosphere plays in a person's satisfaction with a store. Thus, our last hypothesis is as follows:

H₆: The higher is the cognitive age of a person, the greater is the positive impact of the atmosphere of a grocery store on their satisfaction.

All six of these hypotheses that propose a moderating effect of cognitive age on the effect of various store attributes on satisfaction are included in our conceptual model, depicted in Figure 1. In the next section, we test the proposed moderating effects.

Figure 1: Conceptual model

Empirical study

Research design

To test the conceptual model we use data from a survey that focused on the grocery shopping behaviour of older consumer cohorts in a typical Western European urban retail environment, that is high store density, high standardisation of outlets, and a high level of competition based on price and quality. The sampling approach consisted of two stages: In order to target the most appropriate informants in terms of store patronage by older shoppers within households, we first drew a purposive sample and included only those consumers older than sixty who had no disabilities that substantially constrained them in their daily lives and who were able to carry out their grocery shopping themselves (Burt & Gabbott, 1995; Meneely,

Strugnell, & Burns, 2009a). We chose a cut-off age of sixty, in line with other studies on store patronage by elderly consumers (e.g. Hare, 2003; Kaapke et al., 2005). We then applied quota sampling, using age, gender and district of residence as quota controls. Once respondents who satisfied the selection criteria had been identified, professional interviewers administered the pretested, standardised questionnaire, in the elderly shoppers' own homes. Out of a sample of 800 older grocery shoppers, we selected the 404 who indicated that they patronised supermarkets – the dominant retail format in this urban retail market.

Besides questions on grocery shopping habits and store patronage behaviour – with respect to their most frequently visited grocery store – we asked the respondents to evaluate their self-perceived age, based on a scale introduced by Barak and Gould (1985) and recommended by Sudbury and Simcock (2009). This multidimensional scale includes items indicating age along the dimensions of feel (psychological/emotional), look (biological/physical), act (social), and think (cognitive/intellectual interests). Based on these items, the respondents had to evaluate the age decade into which they believed they would fall. The convergent validity of this scale is remarkable, with a Cronbach alpha value of 0.930.

Sample characterisation

The sample represents elderly consumers; they are predominantly female, and have retired. Most are married or live with a partner. As expected in this particular urban and highly developed environment, the educational level is high, with a considerable share of the respondents holding an A-level equivalent or university degree. On average, they live with another person, but only a small number live in the same household with people younger than 18. Every third Euro is spent on groceries, which represents a high share of spending relative

to the net household income. Table 1 provides an overview of the respondents' profile, showing frequencies and measures of central tendencies.

Table 1: Respondents' profile

Age variables	Sample characteristics
Chronological age (years)	μ , 69.89; σ , 8.19
Cognitive age (overall mean)	μ , 59.06; σ , 10.95
<i>Feel age</i>	μ , 59.41; σ , 12.39
<i>Look age</i>	μ , 60.67; σ , 11.02
<i>Act (do) age</i>	μ , 58.00; σ , 11.67
<i>Interest age</i>	μ , 57.33; σ , 12.13
<i>Health age</i>	μ , 60.82; σ , 12.37
<i>Think age</i>	μ , 58.14; σ , 12.45
Other demographic variables	Sample characteristics
Gender (per cent)	Female, 69.7
Marital status (per cent)*	Married/Partnership, 43.8; Single/divorced, 22.0; Widowed, 33.4
Education (top 3, per cent)*	Vocational school, 56.4; A-level equivalent degree, 26.0; University degree, 14.3;
Number of persons in household (incl. respondent)	μ , 1.66; σ , 0.88
Number of children under the age of 18 in the household	μ , 0.11; σ , 0.31
Proportion of retirees (per cent)	81.4
Grocery spending as a percentage of household income	μ , 28.8; σ , 13
Caption: μ , mean value; σ , standard deviation; *, for the sake of simplicity only the three most frequent categories are mentioned so the percentages do not add up to one hundred;	

Comparing the chronological age with the (averaged) cognitive age, we see significant differences. A t -test for dependent samples reveals that the mean values of chronological and self-perceived age decades are significantly different ($t_{(403)}$, 174.29; $p < 0.001$). Almost every second respondent see themselves as cognitively younger than they are on paper (31.9 per cent see themselves as one decade younger than they are, 15.6 per cent as two or more age decades younger). Only 2.2 per cent of our respondents see themselves as having a higher cognitive than chronological age. 50.2 per cent have matched age dimensions. Unsurprisingly, it is those respondents in the later years of each age decade who perceive a match.

Comparing our sample characteristics with the demographics of the city's overall elderly population (60 and older) of two million inhabitants using a χ^2 test, we could not identify

significant differences in gender, marital status, educational level, household size or chronological age ($p>0.05$).

Analysis

The conceptual model includes reflective constructs, thus the indicators represent manifestations of the constructs. The scales measuring our endogenous and exogenous constructs, as described and operationalised in the hypotheses section, were derived from the literature (see appendix). Further, the items were slightly amended based on the results of three focus group discussions including elderly shoppers representing three different age cohorts. To analyse the survey data and test the proposed effects, we applied variance-based structural equation modelling (partial least squares (PLS)) (Chin, 1998; Hair Jr, Sarstedt, Ringle, & Mena, 2012; Tenenhaus, Vinzi, Chatelin, & Lauro, 2005), using the software SmartPLS (Ringle, Wende, & Will, 2005). Overall the PLS approach conveys a number of advantages in terms of measurement and multinormality compared to covariance-based structural equation modelling (SEM) approaches (Hair Jr, Ringle, & Sarstedt, 2011). The downside of the PLS approach is that there is no global optimisation criterion and limited possibilities for testing the overall fit of models (Hair Jr et al., 2012).

The primary motivation for applying PLS was our aim of predicting store patronage rather than testing a theory. Another rationale for applying PLS was that the proposed model is quite complex, including six constructs with three to six indicators each. Furthermore, the procedure for testing moderating effects is difficult to implement for variance-based SEM. PLS allows us to evaluate the effects by preserving the latent nature of the cognitive age construct. As such, and unlike most other authors, we did not test the moderating effects of cognitive age by collapsing the scale into one item, for example by calculating mean values.

As depicted in Figure 1, we took this age construct into account in its generic latent form and applied the product indicator approach, as suggested by, among others, Busemeyer and Jones (1983) and Kenny and Judd (1984). Henseler and Chin (2010) recommend the product indicator approach for models such as that proposed in this paper, that is, models including constructs with many indicators, estimated based on many observations, where the purpose of the estimation is to (1) explain impacts, (2) describe interaction effects and (3) focus on the prediction of endogenous constructs. Furthermore, the product indicator approach is regarded as superior to the frequently used multigroup analysis when the moderating variable is of a latent and continuous nature. Multigroup analysis, and thus the test for invariance between coefficients, is most appropriate in the case of dichotomous moderating variables and experimental designs (Bagozzi, Yi, & Singh, 1991). To investigate the research phenomenon that is the focus of this paper, the literature offers no justification or support for the use of specific age cut-off values, 65, 70 or 75, say, to split our sample into groups. Thus, any dichotomisation would be criticised as being arbitrary and thus suboptimal for testing our hypotheses.

The product indicator approach is to calculate a product term using the indicators of the predicting constructs (in our case the exogenous constructs) and the moderator construct (in our case cognitive age) (Henseler & Chin, 2010). This term is then included as the (latent) interaction term that represents the moderating effect in the structural model. The impact of the interaction term on each of the proposed effects in the model quantifies the significance and the size of the moderating effect. Figure 2 depicts the application of the product indicator approach in our model. Each of the n indicators of our exogenous constructs (ζ_1 - ζ_7) is multiplied separately elementwise, by each of six indicators (m_{11} - m_{16}) of the latent moderator constructs (M_1), resulting in $n*6$ product indicators. We estimated the moderating effect of the cognitive age construct on paths γ_{11} to γ_{17} and interpret the simple effects between the

constructs (β_{1n} - β_{3n}). We test the null hypotheses, that cognitive age does not affect the proposed path, based on the significance level of the coefficient β_{3n} but in addition use the f^2 -value to interpret the strength of the moderating effect (Cohen, 1988).

Figure 2: Estimation of moderating effects

By testing the local fit of the outer or measurement model (i.e. the sets of constructs with the observable items standing behind them) of each of the three groups, we see that all of the t -values of the factor loadings prove to be highly significant ($p < 0.001$) and all of the loadings exceed the suggested size of 0.7 (Hulland, 1999; see appendix). The internal consistency is also considered satisfactory for all factors as the Cronbach alphas all exceed 0.7 (Nunnally, 1978) and the composite reliability of all factors is greater than 0.7 (Fornell & Larcker, 1981).

The degree of convergent validity is acceptable, with average variances extracted (AVE) in the range of 0.5 or higher (Bagozzi & Yi, 1988). With regard to the constructs' discriminant

validity, the AVE is larger than the highest of the squared intercorrelations with the other factors in the measurement model, that is, the Fornell-Larcker ratio (FLR) is less than 1.0 (Fornell & Larcker, 1981; see Table 2 and appendix). It can be concluded that there is a sufficient local fit of the data.

Table 2: Discriminant validity measures

	ζ_1	ζ_2	ζ_3	ζ_4	ζ_5	ζ_6	ζ_7	η_1
Accessibility (ζ_1)	(.818)							
Manoeuvrability (ζ_2)	.229	(.804)						
Shelf management (ζ_3)	.173	.269	(.681)					
Price-value ratio (ζ_4)	.016	.050	.150	(.729)				
Product range (ζ_5)	.155	.256	.300	.050	(.867)			
Atmosphere (ζ_7)	.081	.313	.314	.101	.320	.468	(.611)	
Satisfaction (η_1)	.076	.178	.229	.153	.290	.164	.287	(.834)

Caption: Average Variance Extracted values (AVE) are presented on the diagonal. Squared correlation matrix for latent constructs shown below the diagonal.

To evaluate the overall fit of the models – inclusive and exclusive of the proposed moderator – with the empirical data, we calculated the goodness-of-fit criterion proposed by Tenenhaus et al. (2005) in the form of the geometric mean of the average communality and the average r^2 . Both models provide a reasonable goodness of fit, above the recommended threshold of 0.5 (exclusive moderator 0.565; inclusive moderator 0.582; see main effect model in Table 3).

Finally, we addressed the potential problem of common-method bias in our survey by following the ideas of Podsakoff, MacKenzie, Jeong-Yeon Lee, & Podsakoff (2003). In terms of the dramaturgy and the structure of the research instrument, we clearly separated our questions. Additionally, our professional interviewers guided their respondents carefully and at an appropriate speed from one question stimulus to another. Further, we did not reveal the specific purpose of our project and assured confidentiality to our respondents. Finally, we

conducted a confirmatory factor analysis – parameters estimated based on the maximum likelihood method (Brown, 2006) – subsuming all indicators under one latent factor, i.e. a common method variance factor. The resulting model clearly showed a suboptimal global fit with the empirical data (root mean square error of approximation 0.160 (cut-off value <0.05); Tucker-Lewis index 0.482 (cut-off value >0.9); comparative fit index 0.518 (cut-off value >0.9); CMIN/df 11.368 (cut-off value <2)), which indicates that our results are not affected by common-method bias.

Results

Structural effects

Following Chin (1998), we evaluated the structural models using the coefficients of determination (r^2), the size, signs and significance of the single path coefficients (β_n) and the effect sizes (f^2). The results are presented in Table 3.

First, we ran the main effect model and thereby identified the direct effects of all exogenous factors (ξ_1 - ξ_6) and our latent moderator (M_1) on satisfaction (η_1), without including the interaction term. We see that cognitive age has a significant negative impact on satisfaction, warranting a closer look at the moderating role of this construct on the other effects between the six store attributes and the satisfaction construct. In the main effect model, we identify highly significant and medium-sized effects in the case of product range (β_{15}), price-value ratio (β_{14}) and atmosphere (β_{16}). Neither accessibility (β_{11}), manoeuvrability (β_{12}) nor shelf management (β_{13}) show a significant and substantial impact on the endogenous construct.

Table 3: Moderating effects

Structural and moderating effects	Main effect model Effect (<i>t</i> -value)	Product indicator Effect (<i>t</i> -value)	Strength of moderating effect (<i>f</i> ²)
β_{11} : Accessibility (ξ_1) $\rightarrow$ Satisfaction (η_1)	-.006 (.111) ^(w)	-.038 (.698)	
β_{21} : Cognitive age (μ_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.154 (3.974)	
β_{31} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	.062 (1.316)	
$r^2_{(\eta_1)}$	.443	.447	.007
β_{12} : Manoeuvrability (ξ_2) $\rightarrow$ Satisfaction (η_1)	.073 (1.352) ^(w)	.024 (.438)	
β_{22} : Cognitive age (M_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.169 (4.743)	
β_{32} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	.136 (3.872)	
$r^2_{(\eta_1)}$	.443	.469	.049
β_{13} : Shelf management (ξ_3) $\rightarrow$ Satisfaction (η_1)	.065 (.815) ^(w)	.067 (.655)	
β_{23} : Cognitive age (M_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.145 (3.923)	
β_{33} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	-.004 (.067)	
$r^2_{(\eta_1)}$	.443	.444	.002
β_{14} : Price-value ratio (ξ_4) $\rightarrow$ Satisfaction (η_1)	.203 (4.177) ^(m)	.218 (3.284)	
β_{24} : Cognitive age (M_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.151 (4.645)	
β_{34} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	-.026 (.414)	
$r^2_{(\eta_1)}$	.443	.444	.002
β_{15} : Product range (ξ_5) $\rightarrow$ Satisfaction (η_1)	.306 (4.675) ^(m)	.219 (3.200)	
β_{25} : Cognitive age (M_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.175 (4.943)	
β_{35} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	.170 (4.291)	
$r^2_{(\eta_1)}$	.443	.476	.063
β_{16} : Atmosphere (ξ_7) $\rightarrow$ Satisfaction (η_1)	.215 (4.911) ^(m)	.144 (2.977)	
β_{26} : Cognitive age (M_1) $\rightarrow$ Satisfaction (η_1)	-.145 (4.312) ^(m)	-.151 (4.435)	
β_{36} : Interaction term ($\xi_1 * M_1$) $\rightarrow$ Satisfaction (η_1)	---	.119 (3.201)	
$r^2_{(\eta_1)}$	.443	.464	.039
Note: w, weak effect (<i>f</i> ² -value $\sim .02$); m, moderate effect (<i>f</i> ² -value $\sim .15$); s, strong effect (<i>f</i> ² -value $\sim .35$); <i>t</i> -values calculated by applying a bootstrapping procedure with 1,000 sub-samples (Chin, 1998; Mazursky & Jacoby, 1986); interpretation of <i>t</i> -values: $t_{(999)} > 1.965$, $p < 0.05$; $t_{(999)} > 2.586$, $p < 0.01$; $t_{(999)} > 3.31$, $p < 0.001$; $t_{(999)} > 3.922$, $p < 0.0001$; goodness of fit of the main effect model, 0.582.			

As our next step, we tested each moderating effect separately and included the latent interaction term in the estimation model. Significant but moderate effects for the impacts of product range (β_{35}), manoeuvrability (β_{32}) and atmosphere (β_{36}) on satisfaction could be identified. The three structural effects increase significantly as cognitive age rises and, in all three cases, the strength of the effect is moderate (see *f*²-values in the right-hand column of Table 3). Based on this result, we can confirm hypotheses H₂, H₅, and H₆. Based on the insignificant *t*-values, we see no impact of the moderator on the effects of accessibility (β_{31}), shelf management (β_{33}) and the price-value ratio (β_{34}), so we reject hypotheses H₁, H₃ and H₄.

Discussion and conclusions

The first finding of our study is that cognitive age, which reflects psychological, emotional, biological, physical, social and cognitive dimensions, is significantly lower than chronological age. This difference confirms the findings of other authors (e.g., Kaufman & Elder Jr., 2002; Mathur & Moschis, 2005; Sherman et al., 2001; Sudbury & Simcock, 2009) and indicates the constant nature of consumers' self-concept, that is their own perception of themselves changes only gradually in line with significant life events. As such, the results suggest that knowledge and understanding of customers' self-perceived age can add value for retail marketing and management (Moschis & Mathur, 2006). The measure of cognitive age – alongside chronological age - provides additional and more differentiated information on age and aging in terms of different dimensions and related changes that in turn lead to changes in perceptions and behaviour. From a management perspective all aspects of store related perception and behaviour of the elderly that are significantly influenced or moderated by cognitive age require specific attention when considering the effects of aging on consumers.

Our second finding shows that cognitive age has a significant impact on aspects of store patronage. As such, we see a moderating effect on the impact of three store attributes on store satisfaction; these attributes can be regarded as being of particular relevance for older consumers and satisfaction as a central factor influencing store patronage. In line with the ideas and findings of works such as Gwinner and Stephens (2001), Szmigin and Carrigan, 2001, Sherman et al. (2001), Barak and Gould (1985) and Sudbury and Simcock (2009), we can conclude that cognitive age represents a significant influence on consumers' perceptions and consequently their store satisfaction, and subsequently store patronage. The findings support Simcock, Sudbury, and Wright's (2006) claim that an undifferentiated view of chronological age groups (the 60 plus group in our case) could be of limited use.

Further, we see a significant direct impact of cognitive age on satisfaction. Here, we disconfirm Westbrook and Black's (1985) arguments and see this impact as negative rather than positive – in other words the satisfaction level deteriorates with increasing cognitive age. This is a remarkable result that leads to the conclusion that grocery stores – specifically, the dominant format of the supermarket – may be less fit for the purpose of meeting the needs of elderly shoppers. This ultimately suggests the need to take a closer look at what actually drives the level of (dis-)satisfaction among this consumer segment.

Due to changes in self-perception influenced by psychological, social and biological aging – as reflected by cognitive age – the store becomes more than just a venue in which to purchase products. The whole store-based shopping process is potentially more rewarding, in terms of social interaction, recreation, entertainment and sensory stimulation, for example. The significant moderating effect of cognitive age on the impact of store atmosphere on satisfaction seems to show exactly that. The older shoppers perceive themselves to be, the higher is the impact of atmospheric stimuli that trigger shoppers' senses. The increased importance of store atmosphere for older shoppers extends the findings of Staib (2005) and Kaapke et al. (2005) regarding cognitive age. Consequently, retail management and marketing need to be aware that store atmospherics have an increased importance for cognitively older shoppers and can thus significantly influence their store satisfaction and patronage.

Another core finding is the significantly higher effect of product range on store satisfaction for cognitively older consumers. This supports the ideas of Moschis (2003) and Radford-Lewis (2003). Reasons for the crucial relevance of this product-related store attribute include the deteriorating cognitive and sensory abilities of shoppers – as reflected in the cognitive age measure – and the corresponding increase in risk aversion. We also find support for Lumpkin

et al.'s (1985) findings on the superior importance of product range compared to pricing for cognitively older consumers. For retail marketing and management this finding indicates the superior importance of offering the right width (i.e. number of product categories) and depth of range in order to attract cognitively older consumers. In particular, category management needs to take the product-related needs of cognitively older shoppers into account when deciding on, for example, the appropriate quality and right – rather than too much – product choice to offer. In that context, it must be mentioned that the price-value ratio shows the second highest impact on satisfaction among our sample of older shoppers, which supports the findings of Sirohi et al. (1998) and Moschis et al. (2004). Nevertheless cognitive age does not moderate this relationship and thus this impact remains the same for different cognitive age groups. This ultimately means that the pricing-related attribute is of a similar, substantial, importance for all older shoppers. This result may be due to the high market concentration, high store density and the resulting high level of price competition that is representative of many Western urban retail markets. The considerable efforts of retailers to communicate a low-price image are likely to lead to similar price perceptions among cognitively older as among younger shoppers, despite the former's higher risk aversion and price sensitivity.

Cognitive age reflects changes in biological age and thus one's physical ability to carry out shopping trips. We found that manoeuvrability affects the satisfaction of cognitively older people significantly more. This finding provides empirical support for the arguments of Goodwin and McElwee (1999), and emphasises the importance of in-store movability and orientation for older shoppers, within the remit of shopper logistics (Teller et al., 2012). This clearly extends Lumpkin et al.'s (1985) and Goodwin and McElwee's (1999) ideas of shoppers perceiving themselves as older than they actually are. From a retail management and marketing point of view this finding calls for a stronger consideration of this customer

segment in store design and signage provision, to facilitate their orientation within the store and their movement in the aisles.

The effects of store accessibility and shelf management – both store attributes related to shopper logistics and seen in the literature as relevant for older consumers – on satisfaction are neither significant nor moderated by cognitive age. We thus disconfirm the findings of Tantiwong and Wilton (1985), Whelan et al. (2002), Hare (2003), Moschis et al. (2004) and Meneely et al. (2008). For both attributes, the changing physical and cognitive abilities reflected by cognitive age do not seem to be significant enough to make the physical access to the store and the placement of products on the shelves result in different levels of store satisfaction. In the case of access, this result can be explained by the high density of stores in the investigated urban retail market and the consequent short distances between households and stores. The lack of impact on the link between shelf management and satisfaction could be influenced by the characteristics of the store format investigated here, namely supermarkets. Given the limited number of products on shelves, finding the right product once they have found the appropriate category in the store may be less challenging for older shoppers than it would be in a bigger format, such as a hypermarket (Pettigrew et al., 2005).

Limitations and future research agenda

As with every empirical study, there are some limitations in this one. The applied sampling approach and thus the deliberate choice of informants excluded consumers who are unable to shop for groceries but still influence the shopping process or use other non-store-based formats such as internet shopping. Undoubtedly these consumers and their cognitive age could have an indirect impact on the store patronage of the actual shoppers and should therefore be considered in future studies. Further, this study neglects shoppers younger than

60, who could be included in further studies on the moderating effect of cognitive age on patronage behaviour.

Our empirical study featured the grocery retail industry and focused exclusively on the store-based format of the supermarket. Further investigations on the moderating effects of cognitive age could include patronage behaviour towards other store-based and non-store-based formats and other industries, in particular those relevant to the everyday lives of the elderly. Lastly, our choice of retail environment bears some limitations. Thus we call for further investigations in more rural areas with lower store densities.

Based on the literature on the shopping behaviour of the elderly, and shopper logistics, our conceptual model includes those store attributes seen to be of crucial importance for the older customer segment in particular. Thus, the conceptualisation in our research is indicative rather than comprehensive. Future research could include other independent variables, such as parking, convenience or sales service, that affect satisfaction and store patronage, and the moderating effect of our age variable could be tested on these relationships as well.

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Appendix

Latent construct Indicator	Measures/ indices
ξ₁: Accessibility[†]	
<i>x</i> ₁₁ : You can get to [...] easily.	<i>α</i> , .926
<i>x</i> ₁₂ : You can get to [...] quickly	<i>ρ</i> , .947
<i>x</i> ₁₃ : You can get to [...] without problems	AVE, .818
<i>x</i> ₁₄ : You can get to [...] safely.	FLR, .280
ξ₂: Manoeuvrability[†]	
<i>x</i> ₂₁ : You can move around without problems in [...] .	<i>α</i> , .878
<i>x</i> ₂₂ : You can move around safely and quickly in [...] .	<i>ρ</i> , .925
<i>x</i> ₂₃ : You can easily orientate yourself within [...] .	AVE, .804
	FLR, .390
ξ₃: Shelf management[†]	
<i>x</i> ₃₁ : The products are clearly arranged in [...] .	<i>α</i> , .844
<i>x</i> ₃₂ : Sought products can be found quickly in [...] .	<i>ρ</i> , .895
<i>x</i> ₃₃ : Products can be reached easily in [...] .	AVE, .681
<i>x</i> ₃₄ : Prices can be read without problems in [...] .	FLR, .460
ξ₄: Price-value ratio[†]	
<i>x</i> ₄₁ : The overall price level is low in [...] .	<i>α</i> , .815
<i>x</i> ₄₂ : You can find a lot of special offers in [...] .	<i>ρ</i> , .890
<i>x</i> ₄₃ : The price-quality ratio is good in [...] .	AVE, .729
	FLR, .210
ξ₅: Product range[†]	
<i>x</i> ₅₁ : There is a wide variety of products in [...] .	<i>α</i> , .876
<i>x</i> ₅₂ : There is a wide variety of products in each category.	<i>ρ</i> , .915
<i>x</i> ₅₃ : There is a wide variety of brands in [...] .	AVE, .729
<i>x</i> ₅₃ : There is a wide variety of high quality in [...] products in [...] .	FLR, .487
ξ₆: Atmosphere[†]	
<i>x</i> ₇₁ : The lighting is pleasant in [...]	
<i>x</i> ₇₂ : It is always clean in [...]	<i>α</i> , .873
<i>x</i> ₇₃ : There is no disturbing smell in [...]	<i>ρ</i> , .904
<i>x</i> ₇₄ : The temperature is pleasant in [...]	AVE, .611
<i>x</i> ₇₅ : There is a good mood in [...]	FLR, .766
<i>x</i> ₇₆ : The clientele is pleasant in [...]	
η₁: Satisfaction^{††}	
<i>y</i> ₁₁ : How satisfied are you with the town centre (very dis-/satisfied)	<i>α</i> , .900
<i>y</i> ₁₂ : How does the town centre meet your expectations (not at all/totally)	<i>ρ</i> , .938
<i>y</i> ₁₃ : Think of an ideal grocery store! To what extent does [...] come close to that? (not close/very close).	AVE, .834
	FLR, .440
Caption: †, seven-point rating scale (0, totally disagree ↔ 6, totally agree); ††, bipolar seven-point rating scale (-3↔+3) including a neutral middle category (0); <i>μ</i> , mean value; <i>σ</i> , standard deviation; <i>α</i> , Cronbach's Alpha; <i>ρ</i> , composite reliability; AVE, average variance extracted; FLR, Fornell-Larcker ratio; cutoff values for measurement validity: <i>α</i> >0.7; <i>ρ</i> >0.6; AVE>0.5; FLR<1 (Bagozzi & Yi, 1988; Fornell & Larcker, 1981).	