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Nudging in Retail Context:

Changing purchasing habits using social norms

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Abstract

Food choices can heavily influence health of individuals. Different methods to influence food purchasing habits have been tested, with nudge revealing promising results for the near future. The purpose of this work project is to understand how nudge, specifically social norms, can effectively change food choices and how strong is the applicability in the retail context. Using data from an intervention in a Portuguese supermarket, 1636 participants are studied and concluded that, in fact, nudge positively affected those whose purchasing habits are categorized as less healthy, while those with healthy habits are negatively affected. Moreover, applying this intervention in a larger scale, could deliver great results for retailers and improve society health in general, as well improve research regarding long-term effects of nudging.

Keywords

Nudge; Health; Retail; Social Norms; Consumer Behavior

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1. Introduction

Due to the fast-paced modernization and technological advances of our society, we currently live in a world where computers, cars and devices can facilitate our lives but, on the other hand, this also results in a lack of mobility and physical activity (Arocha, 2019).

The World Health Organization states that the lack of physical activity and simultaneously practices of unhealthy dietary provide a growth of health diseases such as diabetes, heart diseases, strokes, various types of cancers, overweight and obesity. Society is consuming foods high in energy, fats, sugar, and salt, while not eating enough "green" foods such as fruit and vegetables (WHO, 2018). According to the "*First Portuguese Health Examination Survey"* in 2015, the Portuguese adult population was identified with overweight and obesity levels of 39,1% and 28.6%, respectively, representing one of the highest prevalence in Europe only comparable with England and Scotland. Researchers of this study, advise that public health interventions are needed "namely throughout health literacy strategies for promoting awareness of the health hazards" (Gaio et al., 2017).

These interventions have been promoted by public health organizations, governments, and consumers by either legal regulations and economics measures or through education and industry codes (Swinburn et al., 2015). Despite the educational efforts and investments to increase communication regarding this important topic, most of the interventions were only able to create awareness, rather than changing individuals' behaviors towards a healthier lifestyle (Bhattarai et al., 2013). In the recent years, these interventions are being shaped based in behavioral economic principles that change environments and alternatives since individuals acknowledge the need of changing their diet and lifestyles but due to "vast availability of unhealthy foods, health illiteracy or self-regulatory skills" they are not able to fulfill this goal (Marteau et al., 2012). Supermarkets and retail stores account for most food purchases, representing a context that can heavily influence

purchase and eating habits (Hui et al., 2009). When in a supermarket or grocery stores, consumers are faced with a several number of options to choose, causing decisions to be fast and unconscious given the time that consumers spend on shopping and other variables (Just & Gabrielyan, 2018; van Kleef & van Trijp, 2018).

Decision-making processes are not totally rational and are heavily influenced by "psychological biases (present-based biases, choice presentation formats)" (Just & Gabrielyan, 2018) and fast and unconscious impulses. Recent studies have shown that methods targeted at consumers' minds instead of those that limit consumers choices, seem to have a higher level of impact in improving health campaigns effectiveness (Benartzi et al., 2017). These methods are often associated with the term "*Nudge"* which refers to change peoples' behaviors without constraint of options (Thaler & Sunstein, 2008). Since the environment in which individuals make choices can be altered and influence the way the decision-making processes happen, nudge focus on enabling and changing behaviors and decisions that are beneficial for society (e.g. public health) rather than delivering information or change society values system (Thaler and Sunstein, 2008).

It is important to understand how nudge can affect behaviors and what positive outcomes it could deliver for society in the context of health. This study examines how nudges can impact different customer segments purchasing behavior, by introducing a simple nudge in a supermarket. Furthermore, it also analyzes how effective this strategy can be compared to price reductions and, if this type of intervention could be applied to all supermarkets, what would be the long-term effects.

2. Literature Review

2.1 *Overview of Nudge*

Nudges' are defined as any aspect of the decision environment "that alters people's behavior in a predictable way without forbidding any options or significantly changing their

economic incentives" (Thaler & Sunstein, 2008; p.6). It is the adaptation of how information is shown that enables nudges to bring great cost-effectiveness benefits, since studies have discovered that providing information does not necessarily result in effective changes in peoples' behaviors (Abrahamse et al., 2005; Steg & Vlek, 2009). The lack of positive results of providing only information tends to happen because people can be overwhelmed by the amounts of information, lack self-control or be influenced by different context aspects (Reisch & Gwozdz, 2013). Therefore, nudges are usually simple and small changes in the "choice architecture", which represents the outsides forces that guide one's decisions (Thaler and Sunstein, 2008), that will redesign the environment, with the objective of making a certain option more likely to be chosen.

The concept of nudge is often linked with "libertarian paternalism" which represents a policy approach that preserves the freedom of choice although it uses mechanisms to guide people's directions towards desired society behaviors (Sunstein & Thaler, 2003). An ongoing debate about morality of both nudges and libertarian paternalism claim that these methods represent violation of freedom of choice, although their popularity among decision makers and governments is rising (Blumenthal-Barby, 2012 & Goodwin, 2012). Nudging seems to work best on the uninformed and uneducated part of the society, once there is less access to information and understanding, and can be perceived as an unfair method since those who are informed and able to identify a nudge can free-ride the efforts of the majority of those who cannot. These cases tend to happen when policy makers try to achieve common goods such as climate change mitigation and sustainability (Goodwin, 2012; Sunstein & Reisch, 2013). Transparency is, then, an important aspect to take in consideration as some authors accuse nudge of being manipulative and can represent a real risk of government abuse its power (Hausman & Welch, 2010).

Despite the contradictions amongst some authors, (Thaler & Sunstein, 2008) believe that nudge was created to promote behaviors that are beneficial for both individuals and society using

effective interventions. Policy makers dispose two different ways of nudge usage: promote positive behaviors and increase their long-term effects and usage (e.g. consumption of healthy food, reduction of tabaco consumption, alcohol consumption) or counteract the negative impact of other actors' (e.g business, media) and reduce their effects in the long-term (Reisch & Oehler, 2009). Although nudge interventions seem to be effective in the short-term, one of the biggest limitations is that studies do not evaluate their long-term effectiveness (Bucher et al., 2016).

Finally, nudges can be classified into four different types based on how they influence and enable the choice of individuals: *simplification and framing of information* – simplification intents to transform information into a more straightforward way, simplifying processing capabilities and decision-making processes, while framing relies on how information is expressed, activating certain values and attitudes; *changes to the physical environment* – especially in retail context, careful product placement is acknowledged to have significant impact on purchasing choices; *changes to the default policy* – standard options can determine individuals choices since individuals often take the path of least resistance, allowing them to be greatly influenced by defaults choices; *use of social norms* – socialization can have a huge impact on human behaviors, since it shapes ones behaviors similar to their peers (House of Lords, 2011).

2.2 *Social norms in nudge interventions*

Nudge interventions are often designed based on the social norms of a given context. The reasoning behind considers that individuals use their perceptions of peer norms as a standard when comparing their behaviors with their social peers (Clapp & McDonell, 2000, Perkins & Berkowitz, 1986) and the majority of individuals overestimates the prevalence of undesirable behaviors (Borsari & Carey, 2003; Prentice & Miller, 1993).

Therefore, nudge interventions that use social norms designed to reduce alcohol consumption, drug use, changing eating behaviors, gambling, recycling are seen as an alternative to traditional marketing campaigns (e.g. information campaigns, fear inducing messages) (Donaldson et.al, 1995). The objectives of these campaigns are not only to reduce undesirable behaviors but also to correct the targets' misperceptions of the social norm using a descriptive norm (Cialdini et. al, 1991). Although some interventions resulted in the correction of desired behaviors, there are cases where the social-norms campaigns had a boomerang effect that led to the increase of those undesirable behaviors (Perkins et.al, 2005; Wechsler et al., 2003).

Usually, these types of interventions provide a descriptive normative information that refers to what is commonly done or normal in each situation. By comparing their behavior with norms, individuals who perform above the norm are expected to reduce the undesired behavior but for individuals who already rank below the norm, this information might have backwards effect and lead them to the increase of the undesirable behavior (Berkowitz, 2004). According the focus theory of normative conduct (Cialdini et al., 1991) there is a type of social norm – *injunctive norm* – that represents a powerful influence on behaviors. Injective norms can be described as what perceptions are accepted or disapproved within a culture (Reno et al., 1993). The same theory states that if only one of the two types of norms are present in the individual's behaviors, it will exert a much stronger influence on the behavior (Cialdini & Goldstein, 2004).

One experimental study done in a California community was designed to test what effects a descriptive norm *vs.* injunctive plus descriptive norm would have on household energy consumption. Results showed that the descriptive norm would lead consumers above the norm to reduce consumption while those below would raise their consumption levels. On the other side, when applying both norms, there was an insignificant increase in those below the norm and a

decrease of those above. Authors concluded that applying both norms would reduce the boomerang effects (Schultz et al., 2007).

A similar social norm of the case above can also be adapted to food retailing, in order to change individuals' behaviors to increase or decrease a certain type of product. In our specific intervention, the goal was to raise the number of purchased fruits and vegetables, by displaying a message regarding a consumption social norm in a supermarket context.

2.3 *Nudge in health and food retail*

Multiple interventions that aim to increase the consumption of healthier foods through nudges have been tested and implemented throughout the recent years. For example, a school cafeteria in New England, North America, implemented the question *"Would you like a fruit or juice with your lunch?"* before the students' order and the intervention resulted in 70% of students consuming one of those in opposition to 40% if the control group (Schwartz, 2007). An intervention in a buffet restaurant in Denmark, changed the design of a buffet service combining sequence and separating fruits and vegetables and resulted in an increase of self-served fruits and vegetables while reducing the total calorie intake (Kongsbak et al., 2016). Despite the rise in interest for these kinds of interventions, there are still a limited number of articles regarding direct food choices. Most articles and interventions focus on store interventions that influence consumers food purchases (Broers et al., 2017).

Regarding a retail context, most of the interventions are simple changes to product information, physical placement, or environment aspects. In a school cafeteria, adding a descriptive label to the most popular items such as *Zucchini Cookies* to *Grandma's Zucchini Cookies*, resulted in a 27% increase in sales (Wansink et al., 2001). Changing fruits and vegetables location close to cashier instead of sweets, resulted in a sales increase of those products (Goldberg and Gunasti, 2007). A study demonstrated that US consumers were more likely to choose an healthy item from

a shelf when it was positioned at the left when compared to the unhealthy item at the right side, due to display being congruent with their natural mental representation (Romero and Biswas, 2016).

Most of supermarket retailers are motivated to sell fruits and vegetables despite not knowing how to do it effectively (Chandon & Wansink, 2012). Interventions that focus on making these products more convenient, attractive, and normal to select in opposition to unhealthy foods are more likely to be successfully implemented (Wansink, 2015).

Convenience in store is raised by demonstrating how can a healthy food be incorporated in a cooking routine that is familiar for the consumer or placing the product in strategic places that have higher visibility (Desai and Trivedi, 2014). For example, the largest tofu manufacturer in the US created an in-store campaign that teaches consumers how to prepare and cook tofu in 10 minutes, leading to an increase in sales and shopper confidence (Hsu, 2014); placing fruits and vegetables at the front entrance, where every customer needs to pass by, increased in eight percent its' sales when compared to those that were not (Wilson et al., 2016). Attractiveness refers to how attractive a healthier food can be when compared to an unhealthy one, by either changing appearance or price (Hampson & McGoldrick, 2013); rebates, coupons, and bundling can be used to increase fruits and vegetables sales although sometimes it can also result in the increase sales of unhealthy foods in low-income households (Cawley et al., 2016). Displaying fruits and vegetables with a decorated frame around instead of pilling onto a flat table resulted in increased both attractiveness and sales (Stein, 2018). Moreover, signage improves the selection of food that people believe that is normal or popular to purchase as many experiments have shown (Wansink, 2015). For example, signs indicated that Harlem shoppers preferred chickpeas bean over others beans, resulted in an 14% increase of its sales (Bhana, 2017); shopping carts that stated the average purchase of at least five fruits and vegetables increased those sales by 10% (Payne et al., 2014); a

visual norm called “half-plate rule” was used to create balanced meals, as half of your plate should have fruits and vegetables and the other half can be filled with whatever you want, encouraging shoppers to buy higher quantities of fruit and vegetables (Wansink, 2014); similar to the “half-plate rule”, the “half-cart approach” dividing shopping carts into two partitions: instructing one half to be filled with fruits and vegetables and the other half with everything else, resulted in the increase of 18% of fruits and vegetables (Wansink & Herbst, 2017).

2.4 *Research hypothesis development*

This study objective is to expand the current knowledge on this topic, specifically in retail context, by testing and analyzing two different hypothesis that are expected to deliver results and conclusions about the effectiveness of nudge intervention and how it can be applied in long-term perspectives.

Firstly, the main goal of the first hypothesis is to prove that different segments are affected differently by the same intervention, given the same social norm for all. As previously stated, consumers are affected differently when exposed to nudges, leading to either positive or negative behaviors. It is important to identify which segments were successfully targeted and what aspects were improved. Regarding segments that were affected negatively, it is crucial to understand what adjustments should be made to prevent potential drawbacks of interventions.

Secondly, nudge interventions often last for a short period of time and the long-term effects are most of the times ignored. For the second hypothesis, our test focus on the viability of applying the same intervention to all the supermarkets and predict what the effects would be in long-term perspectives.

3. Methodology

3.1 *Auchan's Intervention*

This intervention took place in Amoreiras Shopping, in Auchan, a supermarket chain in Portugal and it was deployed by Nudge Portugal with the objective of increasing the purchase of fruits and vegetables. It ran for a period of three months, during May, June and July of 2019.

The procedure was the follow: Auchan customers were exposed to a social norm in form of a *signage* when picking a shopping cart, with the objective of changing their shopping habits to healthier ones. Understanding effectiveness and how these kind of nudges influence customers, can help companies to achieve higher margins on a specific type of product without the necessity to invest large amounts of money in marketing campaigns, and at the same time, in this specific case, make customers fell healthier by guiding their choices to what is perceived as norm.

3.2 *Participants and procedures*

All the data were gathered from the customers cards from that specific store. For the data to be as close as representative to the reality, it only accounts for customers who purchased at least one fruit or vegetable and used their customers cards when using the check-outs. For comparison purposes, the period chosen to be fully analyzed was from 25 April 2018 to 25 May 2018, when there was not intervention on-going, and 25 April 2019 to 25 May 2019, when the intervention was already in place. This way, it is possible to compare the exact same customers for the exact same period, enhancing the veracity of the data. Furthermore, it is also analyzed the result of the intervention, including the changes along the three months.

After all these filtering, the sample is composed by one thousand six hundred and thirty-six customers who purchased at least one fruit or vegetables during the given periods above. It is taken in consideration that one client can have multiple receipts and that data is also gathered. Apart from

number of receipts, number of fruits and vegetables and variety of products, there is no more information about these clients.

Clients who picked up carts were immediately exposed to the message placed between the handles, "*The healthiest families of this store purchase, at least,* ***eleven fruits and vegetables*** *per visit.* ***And you****?*" (in portuguese, "*As famílias mais saudáveis desta loja, escolhem pelo menos 11 Frutas e Legumes por visita. E você?*") (Appendix A) along with a picture of a cart with apples, pears, oranges and vegetables inside. The same display was also strategically placed near the scales, as it is close to the moment of decision of how many fruits and vegetables customers buy, as well near the pickup baskets. As most of nudges interventions, it represents a very small cost to the store and a great awareness.

3.3 *Segmentation and Variables*

In order to analyze and take conclusions from the purchase behaviors, it is crucial to segment the data into different purchases groups, due to huge differences between the number of articles purchased. As seen in other studies, doing a global analysis of the intervention will not provide accurate and significant insights to the study because different groups will be differently impacted by the nudge exposure. It was found that splitting the analysis into three different categories could provide interesting insights to the study and would enhance the quality of recommendations.

Therefore, the one thousand six hundred and thirty-six customers are segmented based in the total of number of fruits and vegetables purchased, that is, the sum of all fruits and vegetables in each of the receipts in that period of time. The first group called ***LowBuyers,*** represents the clients who have purchased a total sum of less than four articles. The second group, ***MidBuyers***, represents clients who have purchased between four and nine fruits and vegetables. The bigger group, ***HighBuyers***, represents the clients who have purchased more than nine articles. With the

segmentation, it is possible to analyze each type of consumers, allowing to identify variations in purchase behavior as well for the type of product purchased.

The study will focus in analyzing five variables, three of each that are "raw" variables and two that derive from the data gathered. The variables *Receipts19* and *Receipts18* represent the number of receipts in 2019 and 2018, respectively. *UniqueArticle19* and *UniqueArticle18* represent how many different types of articles were purchased (i.e. purchasing two apples and four tomatoes represent two unique articles and a total of six products) for 2019 and 2018, respectively. The *PurchasedArticles19* and *PurchasedArticles18* represent the total number of products purchased in each year, regardless of whether they are fruits or vegetables. Furthermore, the other two variables *UniqueArticles_Receipt* and *PurchasedArticles_Receipt* represent the number of articles per receipt and the number of products per receipt, respectively, in each of the given period of the year.

4. Results

The data were analyzed using the *t-test* significance and paired *t-test*, with a confidence level of 95%, to understand what variables are significant and conclusions can be withdrawn from the data. Using this simple analysis method, provides important insights for future interventions and improvements. The results are divided by segments, following an analysis of the total results.

Table 1. "LowBuyers" sample statistical analysis

Variable	N	Mean	SD	Std. Error Mean
Receipts19	529	1.93	1.576	0.069
Receipts18	529	1.24	0.478	0.021
UniqueArticle19	529	4.03	3.662	0.159
UniqueArticle18	529	1.80	0.771	0.034
PurchasedArticles19	529	4.55	4.563	0.198
PurchasedArticles18	529	1.84	0.794	0.035
UniqueArticles_Receipt19	529	2.2425	1.66602	0.07244
UniqueArticles_Receipt18	529	1.5362	0.72147	0.03137

PurchasedArticles_Receipt19	529	2.3697	1.69138	0.07354
PurchasedArticles_Receipt18	529	1.5595	0.70493	0.03065

Table 2. "LowBuyers" paired t-test analysis

Variables	Mean	SD	S.Error Mean	t	df	*p*
Receipts19 - Receipts18	0.692	1.573	0.068	10.115	528	0.000
UniqueArticle19 - UniqueArticle18	2.234	3.681	0.160	13.961	528	0.000
PArticles19 - PArticles18	2.701	4.565	0.198	13.612	528	0.000
UA_Receipt19 - UA_Receipt18	0.70631	1.70196	0.07400	9.545	528	0.000
PA_Receipt19 - PA_Receipt18	0.81017	1.72840	0.07515	10.781	528	0.000

Note. 'PArticles' refers to the variable *PurchasedArticles*, 'UA_Receipt' refers to the variable *UniqueArticles_Receipt* and and 'PA_receipt' refers to the variable *PurchasedArticle_Receipt.*

For the low volume segment, the paired t-test analysis of the difference of the variables, showed that results are statistically significant ($p<0.05$), and therefore, possible to repeat in the future given the same context.

Results show that, in this segment, it is possible to notice not only a substantial increase in the number of fruits and vegetables purchased in comparison to the same period last year, but also a similar increase in the variety of the products purchased. On average, each client increased the total purchase of fruits and vegetables by **2.7** and the variety of the products by **2.23**, more than doubling its' consumption when compared to the same period last year. Furthermore, the number of total articles increased by **0.81** per receipt and unique articles increased **0.7** per receipt. It is possible to conclude that the nudge intervention represented a strong influence in this kind of consumers.

Table 3. "MidBuyers" sample statistical analysis

Variable	N	Mean	SD	Std. Error Mean
Receipts19	561	2.75	1.941	0.082
Receipts18	561	2.65	1.411	0.060
UniqueArticle19	561	6.65	5.310	0.224
UniqueArticle18	561	5.27	1.692	0.071
PurchasedArticles19	561	8.06	7.512	0.317
PurchasedArticles18	561	6.06	1.730	0.073
UniqueArticles_Receipt19	561	2.8590	2.40981	0.10174
UniqueArticles_Receipt18	561	2.7239	1.88234	0.07947
PurchasedArticles_Receipt19	561	3.2140	2.83752	0.11980
PurchasedArticles_Receipt18	561	2.9518	1.75478	0.07409

Table 4. "MidBuyers" paired t-test analysis

Variables	Mean	SD	S.Error Mean	t	df	*p*
Receipts19 - Receipts18	0.102	1.962	0.083	1.227	560	0.220
UniqueArticle19 - UniqueArticle18	1.373	5.173	0.218	6.285	560	0.000
PArticles19 - PArticles18	1.998	7.440	0.314	6.361	560	0.000
UA_Receipt19 - UA_Receipt18	0.13515	2.44972	0.10343	1.307	560	0.192
PA_Receipt19 - PA_Receipt18	0.26224	2.83559	0.11972	2.190	560	0.029

Note. 'PArticles' refers to the variable *PurchasedArticles*, 'UA_Receipt' refers to the variable *UniqueArticles_Receipt* and and 'PA_receipt' refers to the variable *PurchasedArticle_Receipt.*

In the mid volume segment, the paired t-test analysis of the difference of the variables, showed that results are statistically significant ($p<.05$), with the exception of the pair analysis of receipts and number of unique articles per receipt ($p>.05$).

The results in this segment represent an increase in the number of fruits and vegetables purchased in comparison to the same period last year, but with a smaller impact than the low volume group, both for the number and type of product purchased. On average, each client increased the total purchase of fruits and vegetables by **1.9** and the variety of the products by **1.37**, representing an increase of **33%** and **26%**, respectively. Furthermore, the number of total articles

increased by **0.26** per receipt. In this group, the nudge intervention positively influenced consumers but with a less extent than the previous group.

Table 5. "HighBuyers" sample statistical analysis

Variable	N	Mean	SD	Std. Error Mean
Receipts19	546	4.92	4.791	0.205
Receipts18	546	5.89	4.843	0.207
UniqueArticle19	546	13.49	12.175	0.521
UniqueArticle18	546	15.31	9.380	0.401
PurchasedArticles19	546	19.33	24.280	1.039
PurchasedArticles18	546	22.47	19.229	0.823
UniqueArticles_Receipt19	546	3.4113	2.60820	0.11162
UniqueArticles_Receipt18	546	3.6597	2.78074	0.11900
PurchasedArticles_Receipt19	546	4.2219	2.94006	0.12582
PurchasedArticles_Receipt18	546	4.7257	2.88551	0.12349

Table 6. "HighBuyers" paired t-test analysis

Variables	Mean	SD	S.Error Mean	t	df	*p*
Receipts19 - Receipts18	-0.973	2.876	0.123	-7.901	545	0.000
UniqueArticle19 - UniqueArticle18	-1.821	7.800	0.334	-5.454	545	0.000
PArticles19 - PArticles18	-3.137	13.280	0.568	-5.520	545	0.000
UA_Receipt19 - UA_Receipt18	-0.24841	2.73402	0.11701	-2.123	545	0.034
PA_Receipt19 - PA_Receipt18	-0.50381	2.87545	0.12306	-4.094	545	0.000

Note. 'PArticles' refers to the variable *PurchasedArticles*, 'UA_Receipt' refers to the variable *UniqueArticles_Receipt* and and 'PA_receipt' refers to the variable *PurchasedArticle_Receipt.*

For the high-volume segment, the paired t-test analysis of the difference of the variables, showed that results are statistically significant ($p<.05$), and therefore, possible to repeat in the future given the same context.

The results in this segment show a decrease in the number of fruits and vegetables purchased in comparison to the same period last year, both for the number and type of product purchased. On average, each client decreases the total purchase of fruits and vegetables by **3.14**

and the variety of the products by **1.82**, representing an increase of **14%** and **12%**, respectively. Furthermore, the number of total articles decrease by **0.50** per receipt and unique articles decreased **0.24** per receipt. In this group, the nudge intervention negatively influenced consumers, leading to a reduction of healthy products sales.

Table 7. Total sample statistical analysis

Variable	N	Mean	SD	Std. Error Mean
Receipts19	1636	3.21	3.364	0.083
Receipts18	1636	3.28	3.512	0.087
UniqueArticle19	1636	8.08	8.898	0.220
UniqueArticle18	1636	7.50	7.942	0.196
PurchasedArticles19	1636	10.69	16.189	0.400
PurchasedArticles18	1636	10.17	14.255	0.352
UniqueArticles_Receipt19	1636	2.8440	2.31894	0.05733
UniqueArticles_Receipt18	1636	2.6522	2.16861	0.05362
PurchasedArticles_Receipt19	1636	3.2774	2.66996	0.06601
PurchasedArticles_Receipt18	1636	3.0936	2.37663	0.05876

Table 8. Total paired t-test analysis

Variables	Mean	SD	S.Error Mean	t	df	*p*
Receipts19 - Receipts18	-0.066	2.312	0.057	-1.155	1635	0.248
UniqueArticle19 - UniqueArticle18	0.586	6.070	0.150	3.902	1635	0.000
PArticles19 - PArticles18	0.512	9.551	0.236	2.167	1635	0.030
UA_Receipt19 - UA_Receipt18	0.19183	2.37359	0.05868	3.269	1635	0.001
PA_Receipt19 - PA_Receipt18	0.18375	2.60033	0.06429	2.858	1635	0.004

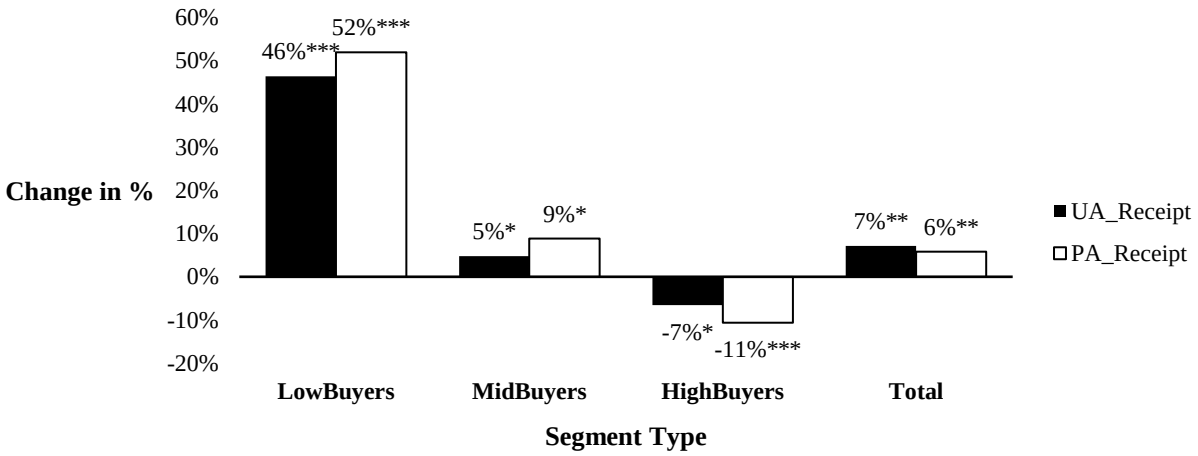
Note. 'PArticles' refers to the variable *PurchasedArticles*, 'UA_Receipt' refers to the variable *UniqueArticles_Receipt* and and 'PA_receipt' refers to the variable *PurchasedArticle_Receipt.*

When looking at the full monthly results, the paired t-test analysis of the difference of the variables, showed that results are statistically significant ($p<.05$) except for the receipts.

The results of the intervention show that, in an overall perspective, the number of fruits and vegetables purchased in comparison to the same period last year has increased, both for the number

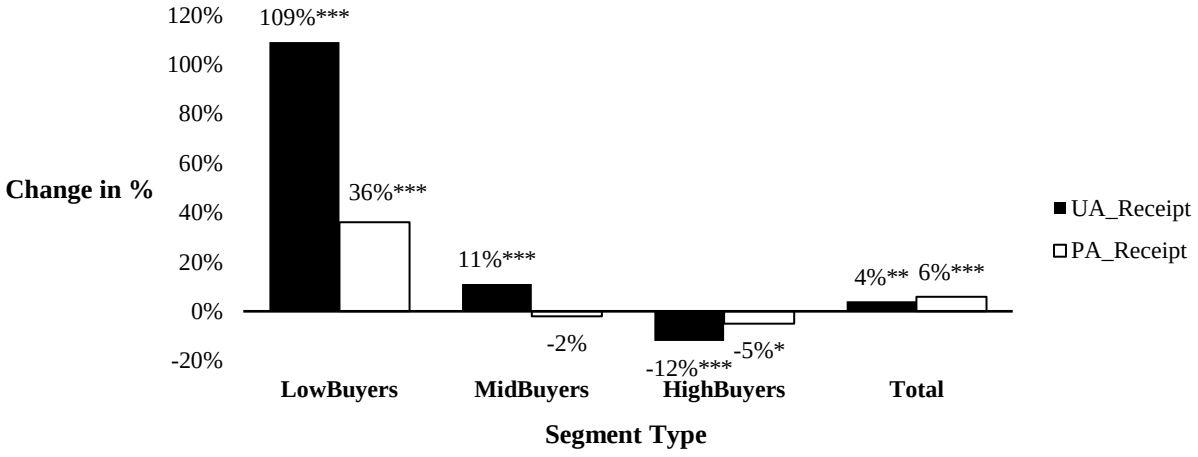
and type of product purchased. On average, each client increased the total purchase of fruits and vegetables by **0.512** and the variety of the products by **0.58**, representing an increase of **5.11%** and **7.77%**, respectively. Furthermore, the number of total articles increased by **0.18** per receipt and unique articles increase **0.19** per receipt.

Fig 1. Variation per segment during May.



*Note. *p<.05; **p<.01; ***p<.001*

Fig 2. Variation per segment in the end of the intervention for all months.



*Note. *p<.05; **p<.01; ***p<.001*

During May, the results showed that the group who purchased least fruits and vegetables was the most influenced by the nudge intervention, followed by the "MidBuyers". As expected, the group with the highest consumption levels was negatively affected, although, in general terms the intervention resulted in an increase of 7% in unique articles per receipt and in 6% increase in the total number articles per receipt. For the three-month period, results tend to be like the first month, with the exact same patterns in each of the segments, with a stronger variation in the first segment. Overall, the intervention was considered successful and led to increase of fruits and vegetables purchase.

Interestingly, the overall results for both periods are also statistically significant ($p<.05$), which allows to conclude that a similar intervention could have potential similar results if applied at a larger scale.

5. Discussion

We can state that the nudge intervention applied by Auchan positively impacted customers at a general level, although not all are influenced the same way. The aim of current research focus on identifying and understand what aspects could be improved for future nudge retail interventions, especially in the health context, based in the results of an in-field intervention. Retailers have started to look at nudge interventions as valid options that provide short-term results that can deliver win-win situations, at a marginal cost. In our case, Auchan was able to increase sales on healthy products and, at the same time, increase the consumption of healthy products of their customers for two of three segments, while negatively influencing the segment who already purchased large amounts of fruits and vegetables. It is crucial for retailers to understand that the outcomes will never be equal for everyone, and therefore, delivering the right message for the right segment will increase the positive impact of each nudge intervention.

5.1 *Theoretical implications*

Results for the three different segments over the period of May and the three months, have confirmed the first hypothesis that segments are affected differently to the same nudge. The first two segments presented an increase in the consumption for fruits and vegetables, with a stronger influence on the first segment compared with the second. As seen in previous experiments with social norms, the message that customers were exposed represented a social norm for the consumption of fruits and vegetables for specific supermarket, providing a stimulus to purchase an average number of eleven fruits and vegetables. Customers in the first segment were most positively influenced due to having the largest gap of all three groups, highlighting the power of social norms to change consumer behaviors (Cialdini et al., 1991). For the second segment, customers already consumed a level of this products that was closer to the exposed average, leading to a smaller increase than the previous group. It is possible to conclude, in this case, that a social norm had stronger positive effects when the gap of consumption was larger to the stated average. In the opposite side, as expected, the group that previously purchased high amounts of fruits and vegetables was negatively influenced. Most customers were already purchasing higher levels than the average stated by the social norm, adjusting their consumption behavior to a level closer to the social norm average. In this case, the exposed social norm led the segment to an unwanted effect, demonstrating that the same social norm had a constructive and destructive effects (Schultz et al., 2007). Apart from the number of products, the nudge intervention also carried an implicit social norm that boosted the variety of products purchased. Since the intervention intention was to increase the volume purchased, the "*and*" in the signage also stimulated customers to buy differentiated products to consume.

Although the intervention was performed in a short period of time, different possibilities and outcomes could result if the intervention were applied during a longer period and in all supermarkets. As nudges focus on improving individuals and society long-term interests (Thaler

& Sunstein, 2008), a longer intervention could result in such increase of purchasing overtime, that new healthy eating habits were created or that the "eleven fruits and vegetables" would represent a smaller number, affecting even more the segment who are already above the stated average.

This analysis provides a useful insight for retailers to understand that nudge interventions will always have positive and negative effects in different segments, although, retailers should adapt each intervention to the type of customer rather than targeting all population. With the adaptation to the different segment characteristics it is possible to maximize the positive effects and minimize the negative ones.

5.2 *Practical implications*

Most nudge interventions goals focus on changing unwanted behaviors and subsequent increase the profits of the store in the long run, while changing customers store behaviors without restricting options. In retail context, several aspects should be assessed by retailers who seek to increase healthy food profits through the use of nudges: Customers tend to be more influenced to make healthy food choices during the process of buying food rather than exposed to information prior to the purchase – interventions like Auchan remind the customer to make healthy food choices since the beginning of the purchasing journey until the checkout payment. Furthermore, it is possible to even enhance nudges' effect by changing several store aspects such as visual display of food, lightning or placement. Another important factor is the size of the store: the store size can work as an influencer for the number of products purchase in each visit (Ailawadi and Grewal, 2016). Therefore, if Auchan intervention was executed in a smaller store, it is very likely that the percentage of small and mid-customers raised, and the intervention would have larger positive impacts.

According to Auchan, a price promotion is expected to increase, on average, 8% to 12% the quantity purchased of an article. Looking at the results from the intervention, in some segments the increase of purchased products was much larger than the stated average, without the need of reducing a price. This way, Auchan was able to achieve a higher volume sold, without damaging margins in the fruits and vegetables category. Moreover, strictly analyzing the intervention effects based only in the number of fruits and vegetables does not reveal true extent of the intervention, especially if customers are in fact substituting unhealthy foods for healthier foods, as wanted, or they just continue to purchase unwanted foods and just add healthier foods to the cart. From a business perspective, it is expected that profits in unhealthy foods decrease, revealing that the intervention is effective, but will be compensated with increases in healthy foods.

Although, given the significance of the total results in the three months, it is possible to test and verify the second hypothesis, to understand what would the impact be if the nudge intervention was applied to all supermarkets, that is, to the annual forty millions visitors. With a 95% confidence interval, it is expected that the total number of purchased articles per receipt would be between 3.141 and 3.399, representing an increase between 1.6% and 9.5% per receipt. When applied to the whole supermarket chain, that is, for the 40 million visitors, Auchan could potentially be selling additional 2.04 million to 12.3 million of fruits and vegetables.

Given these results, Auchan should adjust similar interventions to the size of each supermarket and understand what kind of customer they are targeting. In this specific case, an *injunction norm* stating that high levels of fruits and vegetables consumption brings health benefits, could reduce the negative results in the larger group, delivering even better results in the total analysis.

5.3 *Limitations and future research recommendations*

As the *signage* was placed in the supermarket cart, it is very difficult to account all the participants of this study due to the obvious limitation of gathering the data of thousands of people. Although the number of participants in this intervention was much larger than those accounted, it was found that using the data from customers cards would be the best viable option to extract and further analyze the purchases. One more limitation arises with the fact that customers who do not use supermarket carts, and therefore not exposed to the nudge, can also be accounted in this study of they used their customers cards.

Even though using an in-field intervention for the analysis, there are other limitations for the research that should be taken in consideration when interpreting the results. Auchan supermarket is located inside a shopping center in the center of Lisbon, in a district where the purchase power of customers is above the normal average, meaning that factors such as social class, education level and income levels can affect the results. Another important factor is the season of the year in which the study is based – people shift their healthy shopping behavior depending on the time of the year. At the end of the year, especially from October to December, people shop less healthy than after January 1st, where they start to prepare for the summer (Pope et. al, 2016). Could be possible that, since the study is based on data from a month before summer, the analysis could have been impacted by this factor. Another limitation is also present with the use of isolated *t-tests*: in our analysis, using multiple *t-tests* can increase the statistical error, leading to wrong results and interpretations. Even though this aspect can influence outcomes and recommendations, it is expected the analysis to be as close to the real results.

Apart from the store and analysis limitations, it is difficult to predict similar outcomes in other supermarkets due to demographic and economic limitations of each region. The same could be stated for international interventions since cultures are different from country to country. A level of eleven fruits and vegetables could be already considered normal in another countries, leading to

a larger negative effect or the other way around. Also, infinite reproduction of the intervention would likely lead to a normalization of the consumption, until a point that would have almost zero effect.

Despite existing a large amount of literature regarding the concept of nudge and nudge interventions, there are limited amount of studies that analyze real world situations like this study. It is much more important to understand the changes in consumer behaviors in stores rather than sporadic experimental testing. Using data from store interventions could bring powerful insights depending on the industry and consumer types, helping governments and managers decisions to improve customer experience and behaviors.

Moreover, the existence of long-term analysis in this topic is minimal. With such powerful tool to influence behaviors, long-term analysis of data can provide insights about behaviors, allowing retailers to adjust on-going interventions to the desired results.

6. Conclusion

Nudges seem to be powerful tools to change and promote sustainable behaviors among society, with minimal costs associated. This paper tested evidence and approved that in retail context it is possible to deploy strategies that can effectively change purchasing behaviors. Healthy lifestyles often start at the supermarket and that is the exact place to influence peoples' consuming behaviors. Although nudge interventions have limitations, its' reach and effectiveness seem to be greater than most of marketing techniques, opening a new window for retailers to change customers habits and boost general well-being for society.

7. References

Abrahamse, W., Steg, L., Vlek, C., Rothengatter, T. 2005. "A review of intervention studies aimed at household energy conservation." *Journal of Environmental Psychology*, 25 (3): 273-291.

Ailawadi, L., Ma, Y., Grewal, D., 2016, "Impact of shopping in warehouse club stores on consumers packaged food consumption"

Arocha R. 2019. "Sedentarism, a Disease from Xxi Century." *Clínica e Investigación En Arteriosclerosis (English Edition)* 31 (5): 233–240.

Benartzi, S., Beshears, J., Milkman, K. L., Sunstein, C. R., Thaler, R. H., Shankar, M., Galing, S. 2017. "Should Governments Invest More in Nudging?" *Psychological Science*, *28*: 1041–1055.

Berkowitz, A., 2004. "An overview of the social norms approach", *Changing the culture of college drinking*: 193–214.

Bhana, H. 2017, "Conducting Behavioral Field Research in FoodPantries: Lessons and Tactics for Testing Nutrition Interventions," *Columbia University*.

Bhattarai, N., Prevost, A. T., Wright, A. J., Charlton, J., Rudisill, C., & Gulliford, M. C. 2013. "Effectiveness of interventions to promote healthy diet in primary care: Systematic review and meta-analysis of randomized controlled trials." *BMC Public Health*, 13, 1203.

Blumenthal-Barby J., Burroughs H. 2012. "Seeking better health care outcomes: the ethics of using the "nudge"." *Am J Bioeth*: 1–10.

Borsari, B., Carey, K. 2003. "Descriptive and injunctive norms in college drinking: A meta-analytic integration." *Journal of Studies on Alcohol*, 64: 331–341.

Broers, V., Breucker, C., Broucke, S., Luminet, O., 2017. "A systematic review and meta-analysis of the effectiveness of nudging to increase fruit and vegetable choice." *European Journal of Public Health*, 27: 912–920.

Bucher, T., Collins, C., Rollo, M., McCaffrey, T., Vlieger, N., Bend, D., Perez-Cueto, F., 2016. "Nudging consumers towards healthier choices: A systematic review of positional influences on food choice." *British Journal of Nutrition*, 115: 2252–2263.

Cawley, J., Hanks, A., David, R., Wansink, B., 2016,"Incentivizing Nutritious Diets: A Field Experiment of Relative PriceChanges and How They are Framed"

Chandon, P., Wansink, B. 2012, "Does Food Marketing Need to Make Us Fat? A Review and Solutions." *Nutrition Reviews*, 70 (10): 571–93.

Cialdini, R., Goldstein, J. 2004. "Social influence: Compliance and conformity*." Annual Review of Psychology*, 55: 591–622.

Cialdini, R., Kallgren, C., Reno, R.R., 1991. "A focus theory of normative conduct." *Advances in Experimental Social Psychology*, 24: 201–234.

Clapp, J., McDonnell, A. 2000. "The relationship of perceptions of alcohol promotion and peer drinking norms to alcohol problems reported by college students." *Journal of College Student Development*, 41: 19–26.

Desai, K., Minakshi, T. 2014, "Do Consumer Perceptions Matterin Measuring Choice Variety and Variety Seeking?" *Journal of Business Research*, 67 (1): 2786–92.

Donaldson, S., Graham, J., Piccinin, A., Hansen,W., 1995. "Resistance-skills training and the onset of alcohol use: Evidence for beneficial and potentially harmful effects in public schools and in private Catholic schools." *Health Psychology*, 14: 291–300.

Gaio, V., Antunes, L., Namorado, S., Barreto, M., Gil, A., Kyslaya, I., 2017. "Prevalence of Overweight and Obesity in Portugal: Results from the First Portuguese Health Examination Survey (INSEF 2015)". *Obesity Research and Clinical Practice,* 12 (1): 40–50.

Goldberg, M., Gunasti, K., 2007. "Creating an environment in which youths are encouraged to eat a healthier diet." *Journal of Public Policy & Marketing*, 26 (2): 162-181.

Goodwin T. 2012. "Why we should reject 'nudge'." *Politics,* 32: 85–92.

Hampson, D., McGoldrick, P., 2013. "A Typology of Adap-tive Shopping Patterns in Recession," *Journal of Business Research,* 66 (7): 831–8.

Hausman, D., Welch, B., 2010. "To nudge or not to nudge." *Journal of Political Philosophy* 18 (1): 123-136.

House of Lords, 2011. "Behaviour Change" *House of Lords*

Hsu, C. 2014. "Weight Primary Reason for Increased in TofuConsumption," *Counsel & Heal*

Hui, S., Bradlow, E., Fader, P., 2009. "Testing behavioral hypotheses using an integrated model of grocery store shopping path and purchasing behavior." Journal of Consumer Research, 36: 478–93.

Just, D., Gabrielyan, G., 2018. "Influencing the food choices of SNAP consumers: Lessons from economics, psychology, and marketing". *Food Policy,* 79: 309–317.

Kleef, E., Seijdell, K., Vingerhoeds, M., de Wijk, R., van Trijp, H. 2018. "The effect of a default-based nudge on the choice of whole wheat bread." *Appetite,* 121: 179–185.

Kongsbak, I., Skov, L., Nielsen, B., Ahlmann, F., Schaldemose, H., Atkinson, L. Pérez-Cueto, F., 2016. "Increasing fruit and vegetable intake among male university students in an ad libitum buffet setting: A choice architectural nudge intervention." *Food Quality and Preference*, 49: 183–188.

Marteau, M., Hollands, J., Fletcher, C. 2012. "Changing human behavior to prevent disease: The importance of targeting automatic processes." *Science*, 337(6101): 1492–1495.

Payne, R., Niculescu, M., Just, D., Kelly, M., 2014. "Shopper Marketing Nutrition Interventions," *Physiology & Behavior*, 136: 111–20.

Perkins, W., Berkowitz, D. 1986. "Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming." *International Journal of the Addictions*, 21: 961–976.

Perkins, W., Haines, P., Rice, R., 2005. "Misperceiving the college drinking norm and related problems: A nationwide study of exposure to prevention information, perceived norms and student alcohol misuse." *Journal of Studies on Alcohol*, 66: 470–478.

Pope, L., Hanks, A., Just, D., Wansink B., 2014, "New Year's Res-Illusions: Food Shopping in the New Year Competes with Healthy Intentions" *PLoS One*, 9 (12).

Prentice, A., Miller, T. 1993. "Pluralistic ignorance and alcohol use on campus: Some consequences of misperceiving the social norm." *Journal of Personality and Social Psychology*, 64: 243–256.

Reisch, L. Oehler, A., 2009. "Behavioral economics: Eine neue Grundlage für die Verbraucherpolitik?" *Vierteljahrsh. zur Wirtsch*. 78 (3): 30-43.

Reisch, L., & Gwozdz, W. (2013). "Smart Defaults and Soft Nudges: How Insights from Behavioral Economics can Inform Effective Nutrition Policy." *Marketing, Food and the Consumer: Festschrift in Honour of Klaus G. Grunert*, 189-200.

Reno, R., Cialdini, R., Kallgren, C. 1993. "The transsituational influence of social norms." *Journal of Personality and Social Psychology*, 64: 104–112.

Romero, M., Biswas, D., 2016. "Healthy-left, unhealthy-right: Can displaying healthy items to the left (versus right) of unhealthy items nudge healthier choices?" *Journal of Consumer Research*, 43: 103–112.

Schultz, W., Nolan, J., Cialdini, R., Goldstein, N., Griskevicius, V., 2007. "The Constructive, destructive, and reconstructive power of social norms."*Psycological Science*, 18: 429–434.

Schwartz, M., 2007. "The influence of a verbal prompt on school lunch fruit consumption: a pilot study." *International Journal of Behavioral Nutrition and Physical Activity*, 4 (1): 6.

Steg, L., Vlek, C., 2009. “Encouraging pro-environmental behavior: an integrative review and research agenda.” *Journal of Environmental Psychology*, 29 (3): 309-317.

Stein, K., 2018, “Eyes in an Aisle: How Eye Gaze Level Relatesto Healthy Grocery Store Purchases,” *Cornell UniversityFood and Brand Lab*.

Sunstein, C., 2014. “Behavioral Economics, Consumption and Environmental Protection.” *Handbook of Research on Sustainable Consumption*, 313–27.

Sunstein, C., Reisch, L., 2013. “Green by default.” *Kyklos;* 66 (3): 398-402.

Sunstein, C., Thaler, R., 2003. “Libertarian Paternalism Is Not an Oxymoron.” *The University of Chicago Law Review*, 70 (4): 1159-1202.

Swinburn, B., Kraak, V., Rutter, H., Vandevijvere, S., Lobstein, T., Sacks, G., Magnusson, R. 2015. “Strengthening of accountability systems to create healthy food environments and reduce global obesity.” *The Lancet*, 385(9986): 2534–2545.

Thaler, R., Sunstein, C., 2008. “Nudge: Improving Decisions about Health,Wealth, and Happiness.” *Yale University Press*

Wansink, B., 2015. “Change their Choice! Changing Behavior Usingthe CAN Approach and Activism Research.” *Psychology & Marketing*, 32(5): 486–500.

Wansink, B., Herbst, K., 2017. “Half-Cart Approach to Increas-ing Fruit and Vegetable Purchases in Grocery Stores” *Cornell Food and Brand Lab*.

Wansink, B., Painter, J., Ittersum, K., 2001. “Descriptive menu labels' effect on sales.” *Cornell Hotel Restaurant Adm*, 42 (6): 68-72.

Wechsler, H., Nelson, T., Lee, J., Seiberg, M., Lewis, C., Keeling, R., 2003. “Perception and reality: A national evaluation of social norms marketing interventions to reduce college students’ heavy alcohol use.” *Quarterly Journal of Studies on Alcohol*, 64: 484–494.

WHO, 2020. Healthy diet. Retrieved April 26, 2020 from https://www.who.int/news-room/fact-sheets/detail/healthy-diet

Wilson, N.,, Just, D., Swiger, J., Wansink, B., 2016. “Food Pantry Selection Solutions. A Randomized Controlled Trial in Client-Choice Food Pantries to Nudge Clients to Targeted Foods” *Journal of Public Health*

8. Appendix

Appendix A: Signage in the shopping carts and store.