Sensory disclosure in an augmented environment: memory of touch and willingness to buy

Francesca Serravalle1 · Milena Viassone1 · Giacomo Del Chiappa2

Received: 21 January 2022 / Accepted: 28 October 2022 / Published online: 18 November 2022
© The Author(s) under exclusive licence to Società Italiana Marketing 2022

Abstract
The recent movement restrictions due to the COVID-19 outbreak, and subsequent booming in online buying, show consumers the crucial role of touch as a pre-purchase indicator of good quality products, especially in grocery and fashion sectors. During the pandemic time, consumers were somehow forced to find different alternatives to understand the quality of items before buying. Among these, the adoption of multi-sensory technologies (e.g., augmented reality, AR) or the visual activation of the memory of a material (e.g., wool) was certainly attracting attention from consumers. In this scenario, the purpose of this paper is to explore how AR can activate the memory of products and consumers’ willingness to purchase. Building on qualitative data from semi-structured interviews with 18 Italian consumers, our analysis reveals that AR might enhance consumers’ memory of products, with this sometimes occurring unconsciously. Our findings further deepen the scientific and managerial debate around the role AR might have in influencing/altering consumers’ shopping routines. Contributions to the body of knowledge and managerial implications are discussed and suggestions for further research are given.

Keywords Augmented reality · Memory of product · Willingness to buy · Sensory marketing

Milena Viassone
milena.viassone@unito.it
Francesca Serravalle
francesca.serravalle@unito.it
Giacomo Del Chiappa
gdelchiappa@uniss.it

1 Dipartimento di Management, Università degli Studi di Torino, Turin, Italy
2 Dipartimento di Scienze Economiche e Aziendali, Università di Sassari, Sassari, Italy
1 Introduction

The rise of digital technologies has profoundly transformed the retail sector (Pantano & Viassone, 2015; Shankar et al., 2021), significantly shaping consumers’ shopping experience. To date, consumers are offered the opportunity to live an enriched experience where the physical and digital elements are intrinsically linked, mixed and interconnected, stimulating all five senses. The recent worldwide COVID-19 pandemic with its three lockdowns pushes retailers to find solutions to keep in touch with their consumers (Bettiol et al., 2021; Lo Presti et al., 2021), creating involving and inspiring digital experiences (Corsaro et al., 2021).

In a digitalized scenario, touching products is not possible. In an attempt to overcome this limit, retailers have started to introduce mixing effects in the way consumers experience their shopping.

Recent studies show the importance of touch in consumers, finding that women are more inclined to feel the need for touch than men and that people with a higher need for touch prefer to buy offline (Rathee & Rajain, 2019). Furthermore, existing literature has suggested that there is a positive effect of haptic information through a verbal presentation of the product information (Silva et al., 2021).

To cope with the absence of touch, Augmented Reality (AR) has shown its ability as an effective technology to shape and enhance the traditional e-purchase experience (Tan et al., 2021; Yim et al., 2017). Indeed, this technology can simulate physicality, showing products with the possibility to be superimposed on reality. A practical example could be represented by the Ikea Place AR mobile application, where consumers can superimpose furniture in their homes just using their smartphones. AR appears to be easy to be used everywhere and whenever, and it has a huge potential in terms of try-on in the pre-purchase step when consumers are seeking to identify and evaluate alternatives among which to make a buying choice (Lemon & Verhoef, 2016).

In this context, AR helps consumers in living an immersive experience, offsetting the lack of haptic perception by recognizing products and images shown digitally (Chark & Muthukrishnan, 2013; Kilteni et al., 2012). Moreover, the literature states that the haptic perception (i.e., the awareness of touch sensorial information) in retailing can increase purchase intentions along with psychological ownership in consumers’ minds (Spence & Gallace, 2011). Thus, with the increasing digitisation and usage of digital devices in-store, along with the increasing prevalence of online business (Hilken et al., 2017), touch and in particular its haptic perception is becoming more and more important.

Thanks to the recollection of vivid memories of the prior consumption experiences, which are evoked and activated in consumers’ memory (Segovia & Bailenson, 2009) AR can enhance the purchase experience, in particular, referring to those products where touch exerts a relevant role in allowing consumers to “perceive” and assess the product quality or freshness (Brakus et al., 2009; Hsin et al., 2004). That said, it can be argued that the possibility to visualise a 3D product may largely affect consumers’ memories, activating the process of remembrance of a single item, thus influencing consumers’ decision-making.
While this technological trend is already in action, the effect that AR can exercise on customers’ willingness to purchase as a compensatory cue throughout the “mediation” of memory is still limited (Brasel & Gips, 2015; Henry & Millar, 1993; Peck & Childers, 2003; Rathee & Rajain, 2020; Silva et al., 2021).

Thus, this study aims to investigate the role of AR in stimulating consumers’ memory of products in a digitalized context (where haptic perception could be only stimulated by the technology), understanding if this recollection of sensations affects consumers’ willingness to buy the product.

The remaining part of the paper is organised as follows. The next paragraph presents and discusses the main literature on haptic perception, the role of memory in the decision-making process and the role played by AR in retailing, trying to sum up the main advantages and disadvantages related to this technology in all kinds of applications. Hence, methodology and data collection are explained, showing the exploratory nature of this paper. Then, findings are presented and discussed, and conclusions are framed considering both theoretical advances and managerial implications.

2 Literature review

2.1 Touch, the memory of products and willingness to buy

Touch is one of the first and most important senses humans develop (Krishna, 2012) and it is essential to perceive and experience the world around us (Mulcahy and Riedel, 2018). The importance of touch was pioneered and measured by Harlow (1958), who reported baby monkeys preferred contact with a surrogate cloth over a wire surrogate mother feeding them. Based on this evidence, Peck and Childers (2003) investigated the level of involvement of touch in consumers, creating an ad hoc scale to measure the human need for touch products before buying them: the so-called “Need for Touch” (NFT) scale. This scale categorises individuals into two main groups: (1) the high NFT individuals (i.e., people with higher motivation to examine the haptic attributes of a product), and (2) the low NFT individuals (i.e., those who have a lower motivation to examine the haptic attributes of items). Hence, scholars have suggested that “high NFT individuals” are more willing to buy a product if they can touch it before; on the contrary, for “low NFT individuals” touching the product is not an essential element for their purchase decision-making process (Peck & Childers, 2003).

When consumers live a direct experience with the product, many powerful pieces of information are shown, creating a higher positive attitude towards the product (Smith & Swinyard, 1983). However, not just touching has an impact on consumers’ decision-making. Recent research has found that also mental visualisation (e.g., imagine the haptic perception of a product) could increase perception and positive feelings toward the item, thus implying that both physical and digital/virtual touching play a relevant role in the shopping experience (Brasel & Gips, 2014, 2015). Hence, according to these studies, for individuals to be able to perceive the haptic
sense of an item is sufficient that they have a clear memory of the item in terms of materials, emanated heat, and physical factors.

This is due to the memory that different converging sources of information can elicit because of touching an object, which comes from skin receptors and the external environment. These inputs vary according to many aspects, such as type, size, meaning and familiarity of objects. In this vein, what we usually call “touch” is considered a euphemism for the inter-sensory achievement of information. Each item emits a vibration, called “friction-induced vibrations”, which allows individuals to “recognise” a product (Cesini et al., 2018). Furthermore, skin receptors also convey information by texture, pressure, temperature, pain and light touch, allowing passive touch (e.g., movement) to receive inputs. Hence, once the individuals have been exposed to the haptic experience, their memory codes different information spatially so that it can be recalled later. During this process, information is coded in short-term memory, providing different levels of efficiency in recognition and recall. Following the principle of “economy of coding”, the more parsimonious are the inputs, the greater the likelihood for individuals to recall (Millar, 1999). Hence, once individuals touch a certain item, they develop product familiarity which helps them to recode information more parsimoniously. Then, the tasks (temporary memory) involve longer-term memory, such as the redundancy of converging information, which could have greater or lesser implications (Henry & Millar, 1993).

Based on these considerations, it appears that the sensation of the product can affect memory and the specific memory individuals can have of it. In turn, the feelings experienced during the sensory encounter with the product might be able to influence the willingness or unwillingness to buy a product (Millar, 1999).

2.2 Augmented reality and touch perception in retailing

Traditional retailing expresses itself through physical experiences, with touching products being an important step for consumers to increase their trust and positive feelings about the item. More specifically, touching a product could enhance consumers’ buy intentions along with psychological ownership in consumers’ minds (Spence & Gallace, 2011).

Thus, with the increasing digitisation and usage of digital devices in-store, along with the increasing prevalence of online business (Hilken et al., 2017), touch—and in particular its haptic perception (i.e., the awareness of touch sensorial information)—is becoming more important. Using immersive technology such as augmented reality or virtual reality while shopping, and touching products during the pre-purchase step is quite impossible (Petit et al., 2019; Serravalle et al., 2019). When using VR and/or AR consumers can just digitally visualise the product and activate the memory they have of its physical characteristics. In this context, previous research highlights two different key aspects: (a) the physical contact with the device surface and (b) the utilisation of digital technology to simulate haptic perception. As far as the former aspect is concerned, existing literature has conducted studies aiming to demonstrate a positive effect between touching device screens and consumers’ willingness to buy a product (e.g., Brasel & Gips, 2014). Hence, the
consumer’s desire to purchase an item increases when individuals use haptic touch during mobile retailing advertising. As far as the latter point is concerned, digital transformation is creating many technologies to simulate touch, as occurs in the case of using haptic gloves. Augmented reality (AR) can simulate the real environment, showing items with the possibility to be superimposed on reality.

This technology has become a popular multidisciplinary research field over the last decades, being used in different applications to enhance visual feedback from information systems (Makhataeva & Varol, 2020).

This novel technology involves multiple senses (e.g., sight, smell, touch), becoming sometimes a very complex tool, especially for those who do not have technical abilities (Herpich et al., 2014). Technology readiness is a very important variable to enhance consumers in try-on new digital experiences and understanding the main function of these tools in terms of the benefits perceived (Hur & Lee, 2021; Laera et al., 2021; Zutin et al., 2022).

Thus, to better understand this tool and its main application in real fields, scholars have depicted some advantages and disadvantages related to the utilisation of AR, showing three main domains of applications: (1) health sector, (2) education and (3) retailing (Gatter et al., 2022; Lee et al., 2019; Parekh et al., 2020; Rauschnabel, 2021).

Specifically, the application of AR in the health sector has delineated mostly advantages. Among them, we might consider the possibility to safeguard surgical practices during the pandemic (e.g., a platform called “Proximie” was created to empower clinicians to share their skills in real-time) reducing variation in care and ensuring every patient receives the best healthcare every single time (Parekh et al., 2020). In addition, AR in the health sector was applied related to older adults to let them have the possibility to live some experience (e.g., visit a museum even if they have a reduction in mobility) and enhance their quality of care/life (e.g., surpassing their disabilities) (Lee et al., 2019).

Referring to education, AR shows both advantages and disadvantages. Using this technology during lectures give the possibility to enrich the teaching experience with multimedia content, attracting more student in learning. This is called “memory retention”, which means this technology not only helps retain knowledge but also gives the students the possibility of retaining it for a long period compared to other pedagogical methodologies (Garzòn et al., 2019).

Contrarily, disadvantages are related to the usability and complexity of the tool, which sometimes finds some resistance from teachers (especially the older ones) to apply it during lectures (Akçayır & Akçayır, 2017).

Finally, the retail world has shown an important application of AR to shape the boundaries between the online and offline worlds (Chen et al., 2019). More specifically, AR was used to enhance consumers’ experience in stores, such as letting them the possibility to try-on clothes using virtual mirrors, and at home using mobile applications to superimpose clothes and evaluated their fitness (Huang & Liao, 2017; Javornik, 2016). Moreover, AR is used to quickly reach consumers’ feedback on the experience, enhancing the quality of the instrument and the shopping journey in and off-store (Kong et al., 2019). On the contrary, the lack of touch is huge and sometimes consumers are reticent to use this tool due to the impossibility to
understand the quality of the material (Rauschnabel, 2021). In addition, Chen et al. (2019) show that some consumers perceive this instrument as a stand-alone game, and do not understand the utilitarian part of the application while shopping.

Table 1 sums up all the advantages and disadvantages abovementioned related to AR technology.

In addition, AR was deeply analysed showing its dual function as a hedonic tool, able to let the consumers play and enjoy a new immersive experience, and a utilitarian tool, where consumers reach additional information by the technology, scanning a QR-Code on products and reaching much additional information (Babin et al., 1994; Javornik, 2016).

This kind of information is useful to consumers, who would like to know more about the traceability and Genuity of products, especially in the food and beverage sector, or related to material and its quality, such as in fashion or design sectors (Serravalle et al., 2019). Based on these considerations, it could be argued that digital simulation with AR technology might be able to positively increase consumers’ willingness to purchase a product; this might happen thanks to the role played by AR in creating a more involving experience when compared to a simple and static picture on websites. Moreover, the possibility to visualise a virtual product (able to simulate the physicality) may affect consumers’ memories, activating the process of remembrance of a single item.

This study was therefore carried out to empirically investigate this aspect and, specifically, to analyse which is the role assumed by AR in stimulating the memory of touch in consumers and how this latter influences their willingness to purchase.

3 Methodology

For this study and considering the lack of research related to the phenomenon under investigation, we adopted a qualitative approach. Specifically, 18 semi-structured interviews were carried out with Italians residing in the North of Italy.

We opted for a qualitative approach due to the exploratory nature of this study in understanding whether and in which terms consumers are stimulated to remember the haptic perception of a product using AR and if they are willing to buy it after the experience. The qualitative methodology (and semi-structured interview) is the most used method to let space to deeper investigate consumers’ feelings and emotions, allowing them the possibility to express personal viewpoints (Järvenpää & Lang, 2005; Serravalle et al., 2022).

For the data collection, two researchers contacted several individuals via Facebook and LinkedIn to check for their availability to participate in the study. To be included in the study individuals should have own two main characteristics, namely (1) being residents in the North of Italy, due to the highest digitalization rate this geographical area own when compared to the South (Agenda Digitale, 2019), and (2) owing at least a high school diploma. A recent study shows how the intention to adopt this kind of technology has a statistically significant interaction with the educational level consumers have (Abed, 2021), with technology usage being more likely to occur as the level of education increases. Overall, 20 individuals gave their
| Author(s)                  | Pros                                                                 | Cons                                                       | Sector          |
|---------------------------|----------------------------------------------------------------------|-------------------------------------------------------------|-----------------|
| Garzòn et al. (2019)      | A pedagogical tool to enrich learning and teaching experiences       | Complexity is related to technical aspects                  | Education       |
|                           | Positive outcomes and attitudes of students when using AR systems    |                                                              |                 |
|                           | (academic level improvement, motivation, creativity, autonomy)       |                                                              |                 |
|                           | Memory retention                                                    |                                                              |                 |
| Akçayır and Akçayır (2017) | –                                                                   | Some barriers to overcome such as usability, resistance     | Education       |
|                           |                                                                     | from teachers and overload of information                    |                 |
| Herpich et al. (2014)     | –                                                                   | Complex tool                                                | Education       |
| Channelor and Ma (2019)   | Enhance possibilities in class                                       | AR can cause a cognitive or emotional overload in the        | Education       |
|                           |                                                                     | students                                                    |                 |
| Sirakaya and Sirakaya (2018)| Easy and friendly to use                                            | –                                                           | Education       |
| Parekh et al. (2020)      | Safeguard surgical practices during the pandemic                     | –                                                           | Health          |
| Lee et al. (2019)         | Improve older adults’ social relationships, well-being and quality  | –                                                           | Health          |
|                           | of care                                                             |                                                              |                 |
|                           | Let older adults have the possibility to live some experience        |                                                              |                 |
|                           | Improve the treatment of health-related issues                       |                                                              |                 |
| Parekh et al. (2020)      | Increase the effectiveness of multimedia presentations and videos    | –                                                           | Retailing       |
|                           | Give some learning guides, considering the younger generations’     |                                                              |                 |
|                           | immense use of media                                                |                                                              |                 |
| Kong et al. (2019)        | To access digital information through a layer of information         | –                                                           | Retailing       |
|                           | positioned on top of the physical world                              |                                                              |                 |
| Rauschnabel (2021)        | –                                                                   | Purely digital and therefore not touchable                   | Retailing       |
| Huang and Liao (2017)     | Try-on experiences in and off-stores                                 | –                                                           | Retailing       |
| Javornik (2016)           |                                                                     |                                                              |                 |
| Gatter et al. (2022)      | Extension of traditional channels                                    | –                                                           | Retailing       |
| Author(s)              | Pros                                                                 | Cons                                                                 | Sector    |
|-----------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|-----------|
| Qin et al. (2021)     | Combining the efficiency advantages of e-commerce sites with the sensory benefits of conventional stores | –                                                                    | Retailing |
| Chen et al. (2019)    | Combining virtual information with the real world high adaptation in all fields (e.g., tourism, archaeology, art, retailing, medicine, …) | A stand-alone game, requiring interconnection, collaboration and sharing | Retailing |
| Makhataeva and Varol (2020) | To enhance visual feedback from the information system               | –                                                                    | Retailing |
availability to participate in the study, but two of them were then screened by the sample of analysis not meeting the requirements to be part of this study. All the interviews were conducted face-to-face in June 2020, immediately after the first COVID-19 lockdown. The interviews guaranteed data saturation (Guest et al., 2006).

Each interview started by asking interviewees to report a little information about their online shopping habits. This was done by posing questions such as: “Do you frequently buy products and services online? If yes, why?”, “Which type of products do you often buy online?”, “Why do you tend to prefer to buy online rather than in a traditional retailer?”, “Do you use apps to buy products?” (See Appendix I). Hence, respondents have been invited to reply to questions specifically framed to investigate the extent to which the NFT is relevant to them. Then, respondents have been shown a video describing the AR usage with a product (a box of water). The idea was to recollect in consumers’ minds the idea of thirst on a hot day such as the one in June in the North of Italy and the satisfaction of a personal need, such as the purchase of a box of water. After having watched the video, respondents were then asked to answer again the same questions they answered in the first part of the interview. This was done to understand how consumers’ habits might change after consumers have familiarised themselves with how AR can be used during the buying process of a specific item. Each interview was recorded with the authorization of the interviewee and then fully transcribed and translated into English. The text was then analysed through thematic analysis (Braun & Clarke, 2006). The initial codes were identified separately by two members of the research team (Eriksson & Kovalainen, 2015), with the third member revising the coding to decide whether he/she agreed with the codes. According to existing literature, this was done to reduce potential bias (Strauss & Corbin, 1998). Whenever the research team disagreed about the adopted coding, discussions were made until an agreement was reached, and the final coding was then undertaken, finding four themes that are discussed in the next paragraph.

4 Findings

The average age of the participants was 29 years old, with interviewees aged 19 or above, mostly females and consumers. Most interviewees were reported to be middle-educated (with a high school diploma), employed or still students (Table 2).

The sample is composed of people with a declared propensity towards online purchases and to purchase products online in the future by both website and mobile apps, reflecting the transformation of the retail sector given to the rise of digital technologies. Our interviewees manifested to consider touch one of the most important senses for customers during a shopping experience, letting them quickly understand a plethora of information related to the product, especially in the grocery sector (e.g., maturity of the product). In fact, for most of the interviewees, the possibility to touch a product is very important to understand its quality. A relevant number of respondents also highlighted the fact that the importance of touch depends also on the specific type of product you might need to buy. For example, when consumers need to buy technological products (e.g., laptops, smartphones), they might
prefer to “physically” touch and interact with the product before buying it. In these circumstances, touching the product, allows consumers to “familiarise themselves” with intrinsic characteristics of the product quality that cannot be easily appreciated without a “physical” based interaction and the assistance of a live in-store assistant.

Qualitative findings offer interesting insight to further deepen the literature devoted to analysing the influence of augmented reality on consumers’ memory of products. After a thorough overview of all the data collected, individual items have been analysed. Successively we proceed to manually code the data: We highlighted sections of our text and came up with shorthand labels or “codes” to describe the main contents. Four main insights emerged concerning (1) AR as a hedonic and useful tool; (2) activation of the memory of product by AR; (3) absence of AR-related readiness: (4) AR does not make individuals willing to purchase.

(i) AR as a hedonic and useful tool

Most participants expressed feelings such as interest, curiosity or fun toward the product when stimulated by the AR-related video (“It’s like I’m watching a cartoon”—ID 15; “It aroused me amazement and curiosity”—ID 17; “During the video, I was interested”—ID 11). The hedonic value embedded in AR lets consumers achieve crucial additional information on the product while shopping. Referring to the utilitarian/functional aspects of this technology, AR is generally considered useful by the respondents of this study related to the possibility to get more

Table 2 Respondents’ profile. Source: Our elaboration

| Interviewee | Gender | Age | Education level | Employment status | Online buying |
|-------------|--------|-----|-----------------|-------------------|---------------|
| ID1         | FEMALE | 19  | DIPLOMA        | STUDENT           | Yes           |
| ID2         | MALE   | 50  | DIPLOMA        | EMPLOYEE          | No            |
| ID3         | MALE   | 21  | DIPLOMA        | EMPLOYEE          | No            |
| ID4         | FEMALE | 21  | DIPLOMA        | STUDENT           | Yes           |
| ID5         | FEMALE | 20  | DIPLOMA        | STUDENT           | Yes           |
| ID6         | FEMALE | 22  | DIPLOMA        | STUDENT           | Yes           |
| ID7         | FEMALE | 21  | DIPLOMA        | STUDENT           | No            |
| ID8         | FEMALE | 21  | DIPLOMA        | STUDENT           | Yes           |
| ID9         | MALE   | 52  | DEGREE         | EMPLOYEE          | No            |
| ID10        | MALE   | 19  | DIPLOMA        | STUDENT           | No            |
| ID11        | FEMALE | 50  | DIPLOMA        | EMPLOYEE          | No            |
| ID12        | FEMALE | 20  | DIPLOMA        | EMPLOYEE          | Yes           |
| ID13        | FEMALE | 23  | DIPLOMA        | EMPLOYEE          | Yes           |
| ID14        | FEMALE | 21  | DIPLOMA        | STUDENT           | Yes           |
| ID15        | FEMALE | 21  | DIPLOMA        | STUDENT           | Yes           |
| ID16        | FEMALE | 26  | BACHELOR       | EMPLOYEE          | Yes           |
| ID17        | FEMALE | 25  | DIPLOMA        | EMPLOYEE          | Yes           |
| ID18        | MALE   | 21  | DIPLOMA        | EMPLOYEE          | Yes           |
information about products’ characteristics. In particular, interviewees state that AR can help to reach a better understanding of products details and characteristics (“AR experience can help to better understand the characteristics of the product”—ID 6), increasing a higher consciousness of the product (“It is important because by giving information about the product, and always higher number of people would be more aware of the characteristics of the product”—ID 7; “AR allows to get to know a product better innovatively and differently”—ID 17).

(ii) Activation of the memory of product by AR

Most of the interviewees stated that by viewing the product through AR they were not helped in remembering the tactile sensations of the displayed product, thus suggesting that AR is not always effectively able to activate this memory without a physical “touch-based” interaction; in fact, just a little number of participants were able to remember/recall the touch sensation once having watched the AR-related video. The sensation of the product through AR seems to affect the memory of these interviewees, bringing some of them back to childhood memories or recollecting past funny experiences (“The video reminded me of my childhood”—ID 3; “The video made me think when I was a child, and I was playing with video games”—ID 18).

The digitalized-based interaction allowed these participants to activate their memory by recollecting experiences from their childhood or to past-experience with video games and entertainment (thus suggesting that AR is providing customers with fun and entertainment values).

Quite interesting results were found when consumers were asked if the product is seen in the video to help them to remind/recall something. Specifically, the most of interviewees declared that the VR-related display of the product was also stimulating their memory about similar/substitutes products, i.e., other beverages, mostly milk (“I thought of a bag of juice or orange soda”—ID 14; “I thought of the milk bag”—ID 19).

Thus, unconsciously AR activates the memory of a product of consumers interviewed, making them remember specific characteristics of the item (e.g., the material of products and its main physical characteristics) or an experience lived (mostly related to the recollection of long-term memory).

(iii) Absence of readiness

An important AR disadvantage emphasized by several interviewees is the possibility to find a low readiness in consumers towards the adoption of technology.

In particular, our data identified two main different reasons making consumers reticence to use AR, namely: (1) consumers do not feel confident in using their smartphones to live a digital experience (“It is not practical because you should always have a technological tool, such as the smartphone, at your disposal”—ID 12) and (2) consumer have low readiness to use the technology (“For older and less technological generations it may be too far from their thinking and point of view and they may not have the incentive to use it”—ID 19).
(iv) AR does not push willingness to purchase

Although displaying a product through AR can contribute to some extent to stimulating the memory of some interviewees, our data does not seem to support the idea that AR might also contribute to increasing the consumers’ willingness to purchase. According to respondents, this might be due to two main reasons: (1) they don’t like the experience (“It did not stimulate my interest in buying the product”—ID 3, 11, 12) and (2) they would like to see and try the product before the purchase (“I would rather try it out for myself before”—ID 6; “Before buying it, I would like to see it personally”—ID 16). Hence, findings seem to reveal that the main inhibitors preventing individuals from being willing in buying the product when stimulated by an AR-based elicitation are the impossibility to touch or personally see the product and/or the poor familiarity they have with technology and specific features of the bottle (design, colour).

5 Discussion of findings

Summarising all the results previously discussed, our study seems to suggest that AR emerges as a very useful marketing tool allowing firms to approach consumers, elicit positive feelings and emotions and allow individuals to effectively retrieve and increase the amount of available information about the product. Interviewees appreciated the possibility to use AR to make effective comparisons among features of different products and to select the best option for them, confirming the utilitarian aspect of this tool (Babin et al., 1994; Javornik, 2016). Furthermore, the digitalized interaction experience was reported to be attractive for a few individuals, with most of them rather not being interested, because they think the tool needs to be further improved and/or because they consider it fundamental to physically interact with the product to test its quality.

Concerning the effect of AR on the memory of the product, on the whole, findings seem to suggest that AR is not able to recall/remind consumers of their memories about the product. However, AR was found to be able to somehow elicit the recall of consumers about other similar products. Finally, our findings have shown that some obstacles/disadvantages still exist preventing the wider use of VR as a marketing tool. Among these, the most evident result is the lack of readiness in consumers. Specifically, older individuals reported low ease of use regarding AR. This technology requires technology readiness to use mobile applications and older consumers’ lack of knowledge of immersive tools, as suggested by existing studies (Hur & Lee, 2021; Laera et al., 2021; Petit et al., 2019; Serravalle et al., 2019; Zutin et al., 2022). Then, AR could discourage consumers with a low degree of readiness for technology adoption and who are rather interested in experiencing a physical “touch-based” experience. This might also contribute to explaining the reason why AR did not result to be able to make individuals more prone to buy the product displayed in the AR-related environment.
6 Conclusions

In recent years the retail sector has been characterized by intense digitalization (Pantano & Viassone, 2015; Shankar et al., 2021) and a growing number of consumers buying using digital-related distribution channels. However, it should be also noted that in most cases consumers would rather prefer traditional offline purchases due to the lack of haptic experience in the online domain (Petit et al., 2019; Serravalle et al., 2019). In this scenario, this study aimed to examine whether and how AR might activate consumers’ memory about a product and its related features and then make individuals more willing to buy it.

Overall, findings seem to suggest that AR can activate the consumers’ memory about the product and its characteristics, meanwhile being able to elicit their curiosity and interest in the products and functionally and emotionally enrich the consumers’ decision making. Despite this, findings also showed that one barrier that might still prevent wider use of AR is the relatively low level of technology readiness of consumers. Further than this, our results also suggested AR despite being able to re activate the memory about the product, and enrich the shopping behaviour with emotional and hedonic values, is not necessarily driven consumers to be more willing to buy the product. Thus, despite challenging the theoretical-driven idea related to the ability that AR might have in substituting lack of touch that a fully digitalized domain generates for consumers, show that AR effectively stimulates consumers’ memory, especially about the materials used to produce it and its related packaging and, in turn, somehow stimulate the haptic sense of consumers (Brasel & Gips, 2014, 2015).

Our findings are relevant for both researchers and practitioners. From a theoretical point of view, they deepen the scientific debate devoted to investigating the role of AR in eliciting consumers’ memory about products (Brasel & Gips, 2014; Hilken et al., 2017; Krisha, 2012; Spence & Gallace, 2011). In addition, this study contributes to further deepening the existing and still undergoing retail-related literature aimed to investigate whether, and the extent to which, a digitalized product/service experience can be delivered to overcome problems related to the lack of physicality (Bettiol et al., 2021; Lo Presti et al., 2021).

From a managerial point of view, our findings suggest retailers and producers should invest more resources to further increase both the level of familiarity customers have with the use of AR or other digital tools and the sensibility towards sustainable topics to prevent environmental diseases. For example, retailers (eventually in collaboration with the industry) might organize in-store trial experiences supported by promoters to guide individuals, eventually offered with also some economic and hedonic incentives (discounts, gamified experiences, etc.) to download the app and gain familiarity with how to use the AR through, thus increasing the number of prospect customer that might decide to keep on buying products in an AR-based shopping environment. Similarly, or even better contextually, retailers could create ad-hoc videos to explain to consumers how they should use AR. Finally, practitioners might also consider introducing AR-related
features to their online websites to offer a compensatory tool to stimulate a touch-based experience, at least stimulating their mental imagery.

Despite its contribution to theory and practice, this study is not free of limitations. Firstly, this study is explorative and adopts a qualitative-based method (i.e., in-depth interview). This, coupled with the fact that the research is contextualized on a group of individuals from just one country (i.e., Italy), does not permit any kind of generalization of our findings. This said future studies might consider using the findings of this qualitative study as an input to inform, complemented with an appropriate literature review, the development of a survey instrument to be used to collect data from a larger sample of individuals to test, triangulate, expand and generalise our findings. In doing this, future research might also aim at collecting quantitative data from different countries to make cross-cultural comparisons, thus helping to further increase both the generalizability and robustness of the finding. Another limitation of the study is related to the fact that it was based on a fictitious purchase, where participants were provided with a video describing an AR “touch-based” experience but without being asked to experience an actual/real AR try-on using their smartphone. This is to say that in a real lived experience, consumers could be influenced by other variables such as product involvement, cultural background and shopping habits; these aspects were not considered in our study. The controlled environment consumers experienced during our study might have limited the richness of the AR-stimulus they could potentially perceive and experience, thus somewhat biasing our results. Hence, further studies might be carried out trying to address this limitation, and possibly conducting a field experiment, where consumers can experience a real purchase; when conducting such a study it would be also useful to further quantitatively test whether an AR-based shopping environment makes consumers more prone to buy or not.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s43039-022-00060-1.

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

References

Abed, S. S. (2021). Examining augmented reality adoption by consumers with highlights on gender and educational-level differences. Review of International Business and Strategy, 31(3), 397–415.
Agenda Digitale (2019). DESI regionale 2020: Resta forte il gap digitale Nord-Sud e col resto d’Europa. Retrieved 06th June 2022 on the following link. https://www.agendadigitale.eu/cultura-digitale/desi-regionale-2020-resta-forte-il-gap-digitale-nord-sud-e-col-resto-deuropa/
Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. Educational Research Review, 20, 1–11.
Babin, B. J., Darden, W. R., & Griffin, M. (1994). Work and/or fun: Measuring hedonic and utilitarian shopping value. Journal of Consumer Research, 20(4), 644–656.
Laera, F., Fiorentino, M., Evangelista, A., Boccaccio, A., Manghisi, V. M., Gabbard, J., & Foglia, M. M. (2021). Augmented reality for maritime navigation data visualisation: A systematic review, issues and perspectives. *The Journal of Navigation, 74*, 1–18.

Lee, L. N., Kim, M. J., & Hwang, W. J. (2019). Potential of augmented reality and virtual reality technologies to promote wellbeing in older adults. *Applied Sciences, 9*(17), 3556.

Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing, 80*(6), 69–96.

Lo Presti, L., Maggiore, G., & Marino, V. (2021). The role of the chatbot on customer purchase intention: towards digital relational sales. *Italian Journal of Marketing, 2021*, 1–24.

Makhatavaev, Z., & Varol, H. A. (2020). Augmented reality for robotics: A review. *Robotics, 9*(2), 21.

Millar, S. (1999). Memory in touch. *Psicothema, 11*(4), 747–767.

Mulcahy, R. F., & Riedel, A. S. (2018). ‘Touch it, swipe it, shake it’: Does the emergence of haptic touch in mobile retailing advertising improve its effectiveness? *Journal of Retailing and Consumer Services, 54*, 1–8. https://doi.org/10.1016/j.jretconser.2018.05.011

Pantano, E., & Viassone, M. (2015). Engaging consumers on new integrated multichannel retail settings: Challenges for retailers. *Journal of Retailing and Consumer Services, 25*, 106–114.

Parekh, P., Patel, S., Patel, N., & Shah, M. (2020). Systematic review and meta-analysis of augmented reality in medicine, retail, and games. *Visual Computing for Industry, Biomedicine, and Art, 3*(1), 1–20.

Peck, J., & Childers, T. L. (2003). To have and to hold: The influence of haptic information on product judgments. *Journal of Marketing, 67*(2), 35–48.

Petit, P. (2019). *On the high wire*. New Directions Publishing.

Qin, H., Peak, D. A., & Prybutok, V. (2021). A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? *Journal of Retailing and Consumer Services, 58*, 102337.

Rathee, R., & Rajain, P. (2019). Online shopping environments and consumer’s Need for Touch. *Journal of Advances in Management Research.*, 16(5), 814–826.

Rauschnabel, P. A. (2021). Augmented reality is eating the real-world! The substitution of physical products by holograms. *International Journal of Information Management, 57*, 102279.

Segovia, K. Y., & Bailenson, J. N. (2009). Virtually true: Children’s acquisition of false memories in virtual reality. *Media Psychology, 12*(4), 371–393.

Serravalle, F., Vanheems, R., & Viassone, M. (2019). Consumers’ perception of augmented reality: An application to the “Made in Italy” brand. *Impresa Progetto-Electronic Journal of Management, 2*, 1–30.

Serravalle, F., Vannucci, V., & Pantano, E. (2022). “Take it or leave it?”: Evidence on cultural differences affecting return behaviour for Gen Z. *Journal of Retailing and Consumer Services, 66*, 102942.

Shankar, V., Kalyanam, K., Setia, P., Golmohammadi, A., Tirunillai, S., Douglass, T., Hennessey, J., Bull, J. S., & Waddoups, R. (2021). How technology is changing retail. *Journal of Retailing, 97*(1), 13–27.

Silva, S. C., Rocha, T. V., De Cicco, R., Galhanone, R. F., & Mattos, L. T. M. F. (2021). Need for touch and haptic imagery: An investigation in online fashion shopping. *Journal of Retailing and Consumer Services, 59*, 102378.

Sirakaya, M., & Alsancak Sirakaya, D. (2018). Trends in educational augmented reality studies: A systematic review. *Malaysian Online Journal of Educational Technology, 6*(2), 60–74.

Smith, R. E., & Swinyard, W. R. (1983). Attitude-behavior consistency: The impact of product trial versus advertising. *Journal of Marketing Research, 20*(3), 257–267.

Spence, C., & Gallace, A. (2011). Multisensory design: Reaching out to touch the consumer. *Psychology and Marketing, 28*(3), 267–308.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*. Sage publications.

Tan, Y. C., Chandukala, S. R., & Reddy, S. K. (2021). Augmented reality in retail and its impact on sales. *Journal of Retailing, ahead of print*, 0022242921995449.

Yim, M.-C., Chu, S.-C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for E-commerce? An interactivity and vividness perspective. *Journal of Interactive Marketing, 39*, 89–103.

Zutin, G. C., Barbosa, G. F., de Barros, P. C., Tiburtino, E. B., Kawano, F. L. F., & Shiki, S. B. (2022). Readiness levels of Industry 4.0 technologies applied to aircraft manufacturing—A review, challenges and trends. *The International Journal of Advanced Manufacturing Technology, 120*, 1–17.
Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.