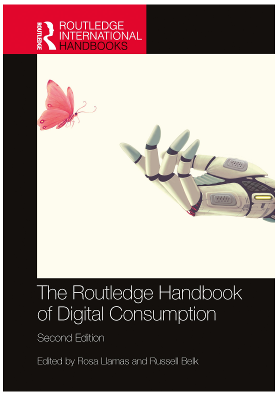


# The Routledge Handbook of Digital Consumption

Rosa Llamas, Russell Belk

# Utilizing Digital Reality in Intergenerational Research

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# UTILIZING DIGITAL REALITY IN INTERGENERATIONAL RESEARCH

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## Introduction

A toddler watches a video on Mom's tablet while Mom Zooms™ into work on her smartphone. A teenager makes a TikTok™ dance video in their room to share with friends. The teenager's sibling is busy trying to help a grandparent navigate Skype™ to virtually participate in a birthday party overseas. The Covid-19 lockdowns that began in 2020 accelerated the ongoing trend of people embracing various forms of digital consumption, communication and connection. Accordingly, researchers are racing to digitize traditional research methods to keep up with the people, pastimes and passions they want to understand. However, marked intergenerational differences remain in terms of comfort and skill with digital reality (DR), which we define as the mimicry or modification of physical spaces and/or objects via computer technology so that the resultant stimuli appear "real" to the natural senses of a subject. DR, evocatively depicted in movies like the Avatar and the Matrix franchise, is gaining traction with organizations and researchers. Yet, despite varying intergenerational preferences for specific digital devices, digital media and software applications, prior research utilizing DR has typically engaged with working-age adults. For instance, Xi and Hamari (2021) reviewed 72 research papers on the application of virtual reality (VR) in shopping research. Noting that only five studies utilized intergenerational samples, and only four focused on users aged 65 or more, they called for researchers to extend the range of ages in future work. Given the lack of age diversity in prior research using advanced digital research methods, we do not yet know how these methods might be best used with, or adapted to, younger or older generations. Consequently, the over-arching purpose of this chapter is to discuss the varying suitability of specific digital research methods for understanding three relatively overlooked generations of consumers (i.e. children aged 3–14, youth aged 15–24, and mature adults aged 60+) in this digital age.

This chapter will first provide an overview of contemporary forms of DR – augmented reality (AR), mixed reality (MR), as well as desktop and immersive "VR". The chapter will then discuss how DR can be used to adapt and extend traditional research methods. Next, this chapter discusses the potential digitization of research methods with the relatively under-researched generations of children, youth and mature adults. Each generation will be discussed with respect to their access and acceptance of digital technology, ways to use

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DR to conduct research with them, and other practical and ethical issues that need to be considered.

## An Overview of Digital Reality

This section provides an overview of DR environments – augmented and MR, desktop and immersive VR – before discussing some ways in which DR might be used to make "research representations more immersive, more collective, more active, more dynamic and perhaps, more overwhelming" (Belk et al., 2018, p. 445).

### *Augmented Reality and Mixed Reality*

AR devices such as Google Lens™ superimpose digital content (that would otherwise not be present in the real world) onto the physical world (Miller et al., 2019). Thus, AR supplements rather than replace reality (Azuma, 1997). Although the digital images stay in place and cannot be manipulated, users can point to objects such as landmarks, books, animals and plants using smartphones or other enabled devices, to view related information. Pokemon Go™, probably the most well-known example of AR, utilizes a handheld device (a smart phone) but AR can also be generated using eyeglasses, headsets, helmets or computer displays (Chen et al., 2019).

MR goes beyond AR's mere superimposition of digital objects onto a real environment, to permit users to manipulate virtual and real objects simultaneously. Like AR, MR superimposes digital objects onto the physical world, but unlike AR, MR allows users to manipulate the objects (other than just point at them to reveal additional information). For example, the AR application IKEA Place™ allowed users to place digital furniture in their living rooms to gauge fit and placement. However, recent developments of the application can be more correctly characterized as MR, because users can now interact with the digital objects e.g. turning digital lamps on, or placing them onto other digital furniture. MR is now available commercially to researchers. For example, the Microsoft Hololens™, a holographic computer worn around the head which utilizes lenses over the wearer's eyes to project holograms, allows the wearer to manipulate and interact with those holograms as if they physically existed.

### *Desktop and Immersive Virtual Reality*

VR technology enables users to interact with digital objects in 3D computer-generated content (Sakatani, 2005). Burdea and Coiffet (2003) defined VR as "a high-end user-computer interface that involves real time simulation and interactions through multiple sensorial channels (e.g. vision, hearing, touch and taste)". Virtual content can range from simple offline digital 3D formats such as 360 photos or videos to complex online virtual world such as Second Life, the World of Warcraft and AltspaceVR. VR is divided into immersive and non-immersive VR, depending on the means by which this virtual content is displayed.

Non-immersive or desktop VR utilizes desktop monitor, tablet or phone display to displace a 3D environment which users can interact with using one or more controllers (e.g. keyboard, joystick, motion capture, face tracker, or eye tracker). However, as Alrehaili and Al Osman (2019) explain, desktop VR users remain aware of the physical (real) world, and, thus, experience a lower level of presence and interactivity compared to immersive VR. Even so, Kostakos et al. (2019) demonstrated that desktop virtual go-alongs where the researchers observed the participants participating in a journey online on foot (a walk-along), by bicycle (a bike-along) or in cars (a ride-along) generated useful findings in ways that were enjoyable for participants. In a desktop VR setting, the participant does not see themselves in an allocentric (third person) perspective but instead sees the world through the screen as if they are seeing it through their own eyes (an ego-centric or first-person perspective).

One particularly sophisticated form of desktop VR that has captured people's imaginations is the virtual world (e.g. Second Life, the World of Warcraft, Minecraft, Fortnite and AltspaceVR). Virtual worlds are two-dimensional or 3D representations of natural or imagined places (Blascovich et al., 2002) that exist, whether someone is logged in or not (Inman, Wright and Hartman, 2010). A virtual world is populated with many users, represented by avatars – "digital representations of users in digital spaces that allow uses to interact with that virtual environment or other people" (Lee, Xiao and Wells, 2018, p. 173). Avatars that are controlled by organizations/researchers (e.g. chatbots) rather than users/participants are often termed virtual "agents" when describing research methods, in order to clearly indicate the party which is truly in control of the virtual character. Since the participant is represented as an avatar in a virtual world, they see themselves from an external vantage point – an allocentric perspective. Researchers have conducted research as diverse as online experiments (Alcañiz et al., 2019) and participant-observation (Kostakos et al., 2019) in virtual worlds as well as conducting education and training within them (Checa and Bustillo, 2020; Inman, Wright and Hartman, 2010). Initial enthusiasm for conducting research in virtual worlds was tempered by computing and bandwidth limitations resulting in lag effects (Bainbridge, 2007). However, given contemporary advances in digital infrastructure, a resurgence of virtual worlds as research venues is worth considering.

In contrast to desktop VR, immersive VR uses a head-mounted display known as a headset to make users feel like they are psychologically inhabiting the virtual world they are viewing (Huang and Bailenson, 2019). A more complex technology that can generate immersive VR is the CAVE (Cave Automatic Virtual Environment) where the virtual content is provided by multiple projectors and speakers. CAVE users' movements are tracked by the sensors attached to 3D glasses that they wear, so the computer can continuously adjust the generated virtual environment to retain the users' point of view.

VR, whether desktop or immersive, permits far greater experimental control of complex social situations that were previously difficult to control in the field. For example, Huang and Bailenson (2019) told participants that their unseen participant-partner would be controlling another avatar that would be interacting with the participant's avatar. However, in reality, the other virtual character was an "agent" with researchers maintaining complete control over the agent's interactions with the human participant's avatar. Additionally, VR research allows manipulation of one or more variables at a time that could include realistic, imagined or even fantastical settings. For example, researchers interested in consumer bargaining could use VR to create more realistic participation in role-playing scenarios such as price negotiations. Or, suppose a hotel manager in downtown Auckland, inspired by the robot-staffed Hen-Na hotel in Japan (Murphy, Gretzel and Pesonon, 2019), wanted to determine if s/he should commission robots resembling various native animals of New Zealand. Not only would a VR experience of being checked in by a Kiwi bird elicit more realistic customer responses, it would certainly be cheaper to pre-test then having to build an actual working prototype!

There are three important factors to consider, when designing VR. The first decision is the choice of hardware to generate the VR that is to be experienced. There are three ways VR can be generated – via smartphones, the headset device itself or a personal computer

(PC). The PC provides the highest graphic resolution, motion and audio quality and, hence, is likely to be the best option for research projects. However, its greater cost relative to other two options must be considered, if the researcher has significant resource constraints. Furthermore, PC-generated VR must be tethered physically to the VR headset, which may limit the physical radius of its application, whereas the other two cheaper options are considered more mobile/portable. In any case, each type of VR generation mode has its own hardware requirements, which is constantly changing as technology advances. The second factor VR researchers need to consider is the choice of software to run the hardware they have selected. The two companies dominating the software market for VR applications are Unity (www.unity.com) and Unreal Engine (www.unrealengine.com). Both are used by corporate and independent software developers to create virtual environments. The third important factor to consider is termed the "art" (i.e. 3D assets and video). Researchers can get the rights to use ready-to-use virtual objects or characters and create their own (utilizing platforms such as Blender, Maya, and 3DS Max) or employ 3D artists to do it for them.

## Incorporating Digital Reality into Research Methods

This next section discusses how DR could help address several research challenges that carry over from the physical world to the digital world. These include the need to uncover participants' true or subconscious perspectives, the need to remind them of events, actions and reactions which may not be completely recalled without being prompted, and the need to trade off realism with control when creating research scenarios and environments.

### *Uncovering Genuine Perspectives – Projective Techniques*

Researchers typically seek to uncover participants' genuine perspectives regarding phenomena of interest (Levy, 1985) but may sometimes find it difficult to do so (Zaltman, 1996). Researchers must go beyond just trying to determine if participants' accounts actually reflect reality (e.g. when reported attitudes towards recycling are not consistent with actual recycling behavior) to eliciting perceptions that participants may be reluctant to share (e.g. putting non-recyclable rubbish in recycling bins at work) or are not even conscious of (e.g. implicit bias against someone using a single-use plastic drink-bottle). Fortunately, projective methods can elicit deep, subtle insights by using visual and/or verbal stimuli to encourage participants to reveal unspoken or even subconscious feelings and attitudes.

Haire (1950) demonstrated that people made markedly different inferences about unknown others, depending on whether their shopping list included ground or instant coffee. The Haire shopping list projective technique is still used today (e.g. Pinto et al., 2018). Projective techniques are not just used in consumer and marketing research but also in diverse fields such as clinical psychology, education, healthcare and tourism. Although projective techniques have most often been used with working-age adults, some limited research has also successfully employed projective techniques with children (Chan, 2006), youth (Rook, 1985) and mature adults (Minowa and Belk, 2020). This is because projective techniques help overcome language barriers (Piotrowski et al., 1993) and are suitable for use with culturally sensitive topics (Belk, 2013). Projective techniques have been used alone or in conjunction with diverse data collection approaches, including experiments, surveys and depth interviews, both offline and online.

Some common projective methods include associative techniques, completion techniques, constructive techniques, choice/ordering techniques, and expressive techniques

(Lindzey, 1959). Associative techniques generally ask participants to respond to a stimulus with the first word that comes to mind. When association techniques are presented digitally, researchers can easily measure the time taken to respond, providing a measure of the strength with which the participant connects their response to the stimuli (Belk, Fischer and Kozinets, 2013). Completion techniques involve asking participants to complete open-ended or incomplete statements such as "my pet makes me feel…" and can be solicited via surveys or in an online interview. The third category, constructive techniques, asks participants to construct collages of images that represent a phenomenon either as an end to itself (e.g. Belk, Ger and Askegaard, 2003) or as part of a multi-stage research method like the Zaltman Metaphor Elicitation Technique or ZMET™ (Zaltman, 1996) that can include digitally creating collages (Coulter, 2006). Choice (or ordering) techniques ask participants to choose from a group of words, sentences or images or to order them, for example, one could ask children to sort pictures of various foods into "healthy" and "unhealthy" groups. Finally, expressive techniques involve asking participants to include particular stimuli into a self-expressive process (e.g. asking a child to incorporate a parent's smartphone into role-play). Projective techniques can be used in-person but also digitally, to elicit in-depth insights from participants, and thus are likely to continue to be adapted digitally. For example, physical photographs (Heisley and Levy, 1991) can be replaced by digital photos (Contardo, 2004) and videography (Starr and Fernandez, 2007). Digital technology (e.g. Zoom™, FaceTime™, or virtual worlds like Second Life™) makes it possible researchers to utilize projective techniques in online interviews. Moreover, immersive VR permits projective techniques to be used in immersive, real-time and humanized interactions. We believe that immersive VR technology opens up many research opportunities that were previously impossible to consider.

### *Improving Recall – Autodriving*

Observers can watch and record what people do but still not know why they do what they do. As explained earlier, some participants may be unwilling or unable to explain their motivations and/or actions. However, even a person willing to explain why they acted in a particular way may simply be unable to recall what they did. Consequently, a second challenge for researchers is to address participants' incomplete and/or inaccurate recall of past events. This challenge may be addressed using the elicitation technique called autodriving, a technique that utilizes stimuli recorded from the participants' own lives (Belk, 2013). Heisley and Levy (1991) introduced the technique of autodriving to marketing research by showing participants photographs that the researchers had taken of the participants themselves engaging in the focal activity and audiotaped the participants' elicited conversations about the photographs. Then, they showed participants the photographs again, concurrently playing the audio-recording they had made earlier to elicit more discussion.

Starr and Fernandez's (2007) digital adaptation of this method involved attaching a mini camera to a baseball cap worn by the participant. Given that vision is the most important source of information for humans (Belk, 2013; Chen et al., 2019), they wanted to capture the wearer's eye-level vantage, providing an ego-centric or first-person perspective. After gaining shopping mall and retailer consent to record video in the public areas of the shopping mall (which had signs reminding the public that they were being recorded on mall security cameras), the researchers equipped participants with a camera inserted into a baseball cap that was attached to a mini video recorder. This apparatus generated a participant's eye-level point of view of their shopping experience. They then used the participant-generated video to autodrive the participant's perceptions and reflections relating to their lived experienced.

Advances in recording technology have made this first-person type of video recording affordable and accessible to researchers.

The resultant video could and did inadvertently capture bystanders who were not part of the study. In today's technological environment, it is possible for such videos to be misused and distributed without participants' or bystanders' consent. However, there may be times when researchers might decide that the potential benefits outweigh the risks. For example, video-recording participants' experiences from an ego-centric perspective have clear potential to inform research that might otherwise struggle to capture the lived experiences of those with special needs (e.g. when looking at place accessibility for wheelchair users or parents with strollers). While videography has obvious advantages over photographs, McLaughlan (2019) suggests that a recording of an experience within VR is the next logical stimulus for autodriving. Like photographs taken or video recordings made from the participant point of view, VR recordings also provide an advantageous egocentric (inside-out) perspective rather than an allocentric (outside-in) memory prompt. This permits a truer representation of the user's viewpoint, which would make for better recall by the user, and a deeper understanding of the user's lived experiences. Moreover, no bystanders would be inadvertently included in the recording.

## *Creating Realistic, Controlled Research Environments – Virtual Reality*

Researchers have had to make difficult choices when trading off control over research environments with enhancing the realism of those environments (Blascovich et al., 2002). For example, the very presence of an audience (whether real or virtual) alters the phenomenon of interest (Miller et al., 2019). Moreover, resource constraints have often limited researchers to merely asking participants to imagine they were in a particular situation, and then, to imagine how they would act or react in that situation. For example, Goudey and Bonnin (2016) showed mothers one photograph of a robot (from a set of three that varied in degree of anthropomorphism) and asked if that robot would be an acceptable companion for their child. Given sufficient resources and time, it would now be possible to have the mothers trial each of the three robot types as child companions before sharing their views regarding the acceptability of each type. However, these resources are still not available to most researchers. Fortunately, the digital age offers new and resource efficient solutions for these sorts of dilemmas (Alcañiz, Bigné and Guixeres, 2019; Belk, 2017). For example, a contemporary re-investigation of Goudey and Bonnin (2016) could utilize VR simulations where an avatar of the mother's child interacted virtually with a virtual agent that simulated of each of the robot types. Not only would this be more realistic than merely viewing a photograph of each robot, the researcher could control who else was virtually present (e.g. the mother's avatar) and vary the nature of the interactions (e.g. learning vs. playing). These sorts of opportunities would permit researchers to develop and examine more theoretically complex scenarios.

Moving research online removes spatial boundaries and some physical limitations (of the researchers and/or the participants) meaning that anyone, anywhere, equipped with the appropriate technology, can participate. This enables those with accessibility, mobility or disability issues to contribute their perspectives to the research. Additionally, recent developments mean that situating one's research within DR could offer less resource-hungry solutions to researchers seeking to investigate phenomena or contexts that are not cost-effective, or which are, as yet, unavailable. For example, eliciting feedback on a concept design of a new shopping mall or municipal housing project. Not only that, researchers can immerse participants into virtual simulations of the phenomenon of interest to observe their actual reactions and actions, rather than resorting to merely asking them to report how they would respond to a written scenario (Huang and Bailenson, 2019). Finally, utilizing VR maximizes experimental control of the investigated situation (Pan and Hamilton, 2018) and achieves such controls in a more cost-effective and scalable way, in comparison to other physically immersive methods such as role-play (which requires hiring actors). Having explained how DR could transform research methods, we next consider how such digital research methods might be used with younger and older participants.

## Intergenerational Considerations When Conducting Digital Research Methods

The next sections of this chapter discuss the use of DR research methods with the three relatively under-researched generations – children, youth and mature adults. Each generation is discussed with respect to their access and acceptance of digital technology, prior and potential ways to use DR to conduct research with them, and as well as other relevant issues that need to be considered.

### *Digital Research with Children (3–14)*

Assuming they have access to internet and social media (Livingstone and Third, 2017), children tend to be early adopters and frequent users of digital technologies (Tingstad, 2013), actively welcoming new technological experiences (Gecu-Parmaksiz and Delialioğlu, 2020). Thus, it seems logical that any of the DR technologies already discussed would be suitable for use with younger participants – even pre-schoolers have reported enjoying active interactions with DR (Oranç and Küntay, 2019). However, a child attending a research session is likely to react like anyone being summoned to a principal's or an employer's office, by becoming stressed and anxious about giving the "right" answer. Thus, on the one hand, Smith and Handler (2007) recommend that researchers structure research process like play sessions rather than school-related work and tests. However, on the other hand, researchers working with children also must carefully consider all related ethical issues (Tingstad, 2013), to ensure that children, and even more importantly, their guardians clearly understand that the "game" is actually research. Oranc and Küntay (2019) point out that children younger than 2.5 years find it particularly difficult to comprehend the representational nature of virtual content, which is why we suggest that researchers do not engage in research with those younger than three.

Even children three and older are believed to lack the capacity to clearly articulate their feelings and experiences well because of their limited conceptual (Smith and Handler, 2007) and vocabulary skills (Klepsch and Logie, 1982). Because of this, the use of traditional interviews with child participants is limited. In contrast, projective techniques are particularly suitable for studying these children because projective techniques can reveal their inner world (Klepsch and Logie, 1982). Furthermore, projective techniques are recommended for use with participants in elementary/primary school children (i.e. aged 5–12) to help them present opinions and feelings that are difficult for them to express in a non-threatening way (Rabin, 1960). For example, Chan (2006) asked children to draw pictures of other children with many expensive playthings and those without, to examine Hong Kong Chinese children's perceptions of, and feeling about, materialism. However, one could imagine a digital re-investigation of this research where the child participants' avatars play with other child "agents" (i.e. researcher-controlled virtual characters) who have a smaller or greater range of expensive playthings. Creating such digital "playdates" could allow the researcher to examine other influences on the child participants' views of materialism, for example, by having some child agents being willing to share their toys with the participant's avatar, while others are not.

## *Digital Research with Youth (15–24)*

Projective methods might be just as effective with youth, as they might be with children, but for different reasons. Even if youth could articulate their responses to the researchers' questions, they might not want to, either because they do not trust adults in general or because they do not want their responses to become common knowledge. Consider, for example, studies on risky or illegal behaviors such as underage drinking or street racing. A teenaged participant is far more likely to be candid when asked to discuss photographs, videos or even VR simulations portraying someone else engaging in such behavior, then they would be, if asked about their own participation in such behavior.

Additionally, other studies have shown that youth are sometimes more comfortable expressing themselves through digital platforms such as texting, than in face-to-face interactions (Porath, 2011). Not only do teenagers and young adults have high rates of access to, and usage of, social media (Livingstone and Blum-Ross, 2017) and digital devices (Dempsey, 2020), they also quickly adapt to and enjoy using new methods such as interacting in virtual worlds for educational role-play (Vallance et al., 2014). Consequently, research methods that utilize DR are likely to be particularly suitable for teenagers and young adults. However, researchers should recognize that this generation is expressly concerned with the digital footprints they leave behind. Although they manage their different relationship groups by using different groups within a social media platform (Dempsey, 2020) or utilizing different social media platforms for different relationships and purposes (Livingstone and Blum-Ross, 2017), they recognize the ability of others outside their target audience to monitor their online activity (Dempsey, 2020). Consequently, researchers must be aware of their participants' concerns regarding their digital privacy, take steps to ensure their digital privacy is not breached, and carefully explain these efforts to their participants.

## *Digital Research with Mature Adults (60+)*

Mature adults comprise an extremely heterogenous group, ranging from the young-old (60–79) to the old-old (80+). Although children and youth have embraced digital technology in their daily lives (Venkatesh and Dunkle, 2013), the same cannot be said of more mature people. Mature adults have been slower to adopt digital technology and continue to have a lower uptake than the rest of the population (Hülür and Macdonald, 2020), markedly preferring traditional media like newspapers and radio (Nimrod, 2017). Lee et al. (2019) suggest that the paucity of research on mature adults' use of AR and VR is due to this cohort's lack of familiarity with DR. Other researchers have also attributed mature adults' reluctance to use innovative technology to their fear of technology (Lee et al., 2018) and their declining physical and cognitive abilities (Lee and Maher, 2021). However, Schnack et al. (2021), when using immersive VR with participants ranging in age from 18 to 73, found no influence of age, previous familiarity with VR or technology literacy, on the participants' handling of the VR controller or the time spent on their VR shopping trip. It would seem entirely logical to assume that their training and familiarization session that delivered information visually and verbally, and which included active practice and experimentation successfully eliminated any technological hesitation on the part of the more mature participants. Consequently, research with mature adults should include such comprehensive familiarization sessions.

Additionally, a recurrent concern of mature adults is possible loss of privacy (Hülür and Macdonald, 2020; Lee et al., 2018). These concerns of mature participants suggest that research using AR or VR with mature participants must be pre-tested carefully (Lee and Maher, 2021) to ensure that these and other new methodologies are properly adapted to participants' requirements and concerns (Shaked, 2017). For example, Lee et al. (2018) conducted research with mature adults that involved them communicating with an avatar. They suggested that the researcher-created agent be designed to more closely resemble the participants in age to facilitate trust and self-disclosure by this age cohort. It is quite possible that the perceived "age" of the agent (or other avatars) could influence participant trust and self-disclosure but the nature and direction of that influence could vary in nuanced ways. Thus, future research could compare how the age of an avatar influences communication, trust and persuasion across different generations.

Immersive VR requires participants to utilize wearable technology (Lee et al., 2019) and can generate some degree of nausea and dizziness (Pan and Hamilton, 2018). Thus, it may be less suitable for more mature participants who are more likely to wear glasses and be at a greater risk of falls. Furthermore, if headsets are used to generate immersive VR, care must be taken to ensure that the participants do not use a pacemaker or any other medical device that might be affected by the radio waves emitted by the headset (Schnak et al., 2021) – and more mature adults are more likely to utilize such medical devices. Fortunately, mature adults increasingly own smartphones which allow them to access the internet (He et al., 2020) suggesting that using smartphones to conduct digital research is suitable for doing research with this generation. The benefits of convenience and accessibility to the growing number mature consumers around the world make adapting or creating digital research methods for mature adults worthwhile.

## Conclusion

This chapter has introduced some forms of DR, namely, AR, MR and desktop and immersive VR. DR has the potential to enrich existing research methods, including projective techniques, experimentation and autodriving to improve veracity, recall and controlled realism. However, intergenerational differences in acceptance and issues with digital methods exist and must be considered carefully when selecting research methods and designing research procedures. The greatest benefit of utilizing DR in research is the potential to devise scenarios that more closely approximate physical reality in cost-effective ways that carefully protect participants' trust and privacy. Consequently, we encourage researchers to make the effort to master and utilize DR in their research.

## Further Reading

Chen, Y., Wang, Q., Chen, H., Song, X., Tang, H., and Tian, M. (2019). An overview of augmented reality technology. *Journal of Physics: Conference Series*, 1237(2), p. 022082. https://doi.org/10.1088/1742-6596/1237/2/022082

Fox, J., Arena, D., and Bailenson, J. N. (2009). Virtual reality: A survival guide for the social scientist. *Journal of Media Psychology*, 21(3), 95–113. https://doi.org/10.1027/1864-1105.21.3.95

Lee, L., and Maher, M. L. (2021). Factors affecting the initial engagement of older adults in the use of interactive technology. *International Journal of Environmental Research and Public Health*, 18(6), 2847. https://doi.org/10.3390/ijerph18062847

Livingstone, S., and Blum-Ross, A. (2017). Researching children and childhood in the digital age. In P. Christensen, and J. Allison (eds). *Research with Children: Perspectives and Practices* (pp. 66–82), London: Routledge.

## References


Alcañiz, M., Bigné, E., and Guixeres, J. (2019). Virtual reality in marketing: A framework, review, and research agenda. *Frontiers in Psychology*, 10(1530), 1–15. https://doi.org/10.3389/fpsyg.2019.01530

Alrehaili, E. A., and Al Osman, H. (2019). A virtual reality role-playing serious game for experiential learning. *Interactive Learning Environments*, 30(5), 1–14. https://doi.org/10.1080/10494820.2019.1703008

Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments*, *6*(4), 355–385. https://doi.org/10.1162/pres.1997.6.4.355

Bainbridge, W. S. (2007). The scientific research potential of virtual worlds. *Science*, 317 (5837), 472–476. https://doi.org/10.1126/science.1146930

Belk, R. W. (2013). Visual and projective methods in Asian research. *Qualitative Market Research: An International Journal*, 16(1), 94–107. https://doi.org/10.1080/00913367.2016.1201025

Belk, R. W. (2017). Qualitative research in advertising. *Journal of Advertising*, 46(1), 36–47.

Belk, R. W., Ger, G., and Askegaard, S. (2003). The fire of desire: A multisited inquiry into consumer passion. *Journal of Consumer Research*, 30(3), 326–351.

Belk, R. B., Fischer, E., and Kozinets, R. V. (2013). *Qualitative Consumer and Marketing Research*. Thousand Oaks, CA: Sage.

Belk, R. W., Caldwell, M., Devinney, T. M, Eckhardt, G. M., Henry, P., Kozinets R. V., and Plakoyiannaki, E. (2018). Envisioning consumers: How videography can contribute to marketing knowledge. *Journal of Marketing Management*, 34(5–6), 432–458. https://doi.org/10.1080/0267257X.2017.1377754

Blascovich, J., Loomis, J., Beall, A. C., Swinth, K. R., Hoyt, C. L., and Bailenson, J. N. (2002). Immersive virtual environment technology as a methodological tool for social psychology. *Psychological Inquiry,* 13(2), 103–124. https://doi.org/10.1207/S15327965PLI1302_01

Burdea, G., and Coiffet, P. (2003). *Virtual Reality Technology*. New Jersey: John Wiley-Interscience.

Chan, K. (2006). Exploring children's perceptions of material possessions: A drawing study. *Qualitative Market Research: An International Journal* 9(4), 353–366.

Checa, D., and Bustillo, A. (2020). A review of immersive virtual reality serious games to enhance learning and training. *Multimedia Tools and Applications*, 79, 5501–5527. https://doi.org/10.1007/s11042-019-08348-9

Chen, Y., Wang, Q., Chen, H., Song, X., Tang, H., and Tian, M. (2019). An overview of augmented reality technology. *Journal of Physics: Conference Series*, 1237(2), 022082). https://doi.org/10.1088/1742-6596/1237/2/022082

Contardo, I. (2004). Old and new marketing techniques: Using images to penetrate the mind of the global consumer. *CMS Conference 7–9 July 2004*, 1–20.

Coulter, R. A. (2006). Consumption experiences as escape: An application of the Zaltman Metaphor Elicitation Technique. In R. W. Belk (ed.) *Handbook of Qualitative Research Methods in Marketing* (pp. 400–418), Cheltenham: Edward Elgar.

Dempsey, L. (2020). Growing up in a digital era: The journey towards independence, agency and individuality. *Interactions: Studies in Communication & Culture* 11(3), 325–342. https://doi.org/10.1386/iscc_00028_1

Gecu-Parmaksiz, Z., and Delialioğlu, Ö. (2020). The effect of augmented reality activities on improving preschool children's spatial skills. *Interactive Learning Environments*, 28(7), 876–889. https://doi.org/10.1080/10494820.2018.1546747

Goudey, A., and Bonnin, G. (2016). Must smart objects look human? Study of the impact of anthropomorphism on the acceptance of companion robots. *Recherche et Applications en Marketing*, 31(2), 2–20.

Haire, M. (1950). Projective techniques in marketing research. *Journal of Marketing Research*, 14 (5), 649–656. https://doi.org/10.1177/002224295001400501

He, T., Huang, C., Li, M., Zhou, Y., and Li, S. (2020). Social participation of the elderly in China: The roles of conventional media, digital access and social media engagement. *Telematics and Informatics*, 48, 101347. https://doi.org/10.1016/j.tele.2020.101347

Heisley, D. D., and Levy, S. J. (1991). Autodriving: A photoelicitation technique. *Journal of Consumer Research,* 18(3), 257–272.

Huang, S. A., and Bailenson, J. (2019). Close relationships and virtual reality. In T. D. Parsons L. Lin, and D. Cockerham. (eds.), *Mind, Brain and Technology: Learning in the Age of Emerging Technologies* (pp. 49–65). New York, NY: Springer Cham. https://doi.org/10.1007/978-3-030-02631-8_4

Hülür, G., and Macdonald, B. (2020). Rethinking social relationships in old age: Digitalization and the social lives of older adults. *American Psychologist*, 75(4), 554. https://doi.org/10.1037/amp0000604

Inman, C., Wright, V. H., and Hartman J. A. (2010). Use of Second Life in K-12 and higher education: A review of research. *Journal of Interactive Online Learning*, 9(1), 44–62.

Klepsch, M., and Logie, L. (1982). *Children Draw and Tell: An Introduction to the Projective Uses of Children's Human Figure Drawings.* New York: Routledge.

Kostakos, P., Alavesa, P., Oppenlaender, J., and Hosio, S. (2019). VR ethnography: A pilot study on the use of virtual reality 'go-along' interviews in Google street view. In *Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia* (pp. 1–5). New York: Association for Computing Machinery. https://doi.org/10.1145/3365610.3368422

Lee, L. N., Kim, M. J., and Hwang, W. J. (2019). Potential of augmented reality and virtual reality technologies to promote wellbeing in older adults. *Applied Sciences*, 9(17), 3556. https://doi.org/10.3390/app9173556

Lee, L., and Maher, M. L. (2021). Factors affecting the initial engagement of older adults in the use of interactive technology. *International Journal of Environmental Research and Public Health*, 18(6), 2847. https://doi.org/10.3390/ijerph18062847

Lee, Y. H., Xiao, M., and Wells, R. H. (2018). The effects of avatars' age on older adults' self-disclosure and trust. *Cyberpsychology, Behavior, and Social Networking*, 21(3), 173–178. https://doi.org/10.1089/cyber.2017.0451

Levy, Sidney J. (1985). Dreams, fairy tales, animals, and cars. *Psychology and Marketing*, 2 (2), 67–81.

Lindzey, G. (1959). On the classification of projective techniques. *Psychological Bulletin*, *56*(2), 158–168. https://doi.org/10.1037/h0043871

Livingstone, S., and Blum-Ross, A. (2017). Researching children and childhood in the digital age. In P. Christensen, and J. Allison (eds). *Research with Children: Perspectives and Practices*, 66–82.

Livingstone, S., and Third, A. (2017). Children and young people's rights in the digital age: An emerging agenda. *New Media and Society* 19(5), 657–670. https://doi.org/10.1177/1461444816686318

McLaughlan, R. (2019). Virtual reality as a research method: Is this the future of photo-elicitation? *Visual Studies*, 34(3), 252–265. https://doi.org/10.1080/1472586X.2019.1680315.

Miller, M. R., Jun, H., Herrera, F., Yu Villa, J., Welch, G., & Bailenson, J. N. (2019). Social interaction in augmented reality. *PLoS One*, 14(5), e0216290. https://doi.org/10.1371/journal.pone.0216290

Minowa, Y., and Belk, R. W. (2020). Qualitative approaches to life course research: Linking life story to gift giving. *Journal of Global Scholars of Marketing Science*, *30*(1), 60–75. https://doi.org/10.1080/21639159.2019.1613905.

Murphy, J., U. Gretzel and J. Pesonen (2019) Marketing robot services in hospitality and tourism: The role of anthropomorphism. *Journal of Travel & Tourism Marketing*, 36 (7): 784–795. https://doi.org/10.1080/10548408.2019.1571983

Nimrod, G. (2017). Older audiences in the digital media environment. *Information, Communication & Society*, 20(2), 233–249. https://doi.org/10.1080/1369118X.2016.1164740

Oranç, C., and Küntay, A. C. (2019). Learning from the real and the virtual worlds: Educational use of augmented reality in early childhood. *International Journal of Child-Computer Interaction*, 21, 104–111. https://doi.org/10.1016/j.ijcci.2019.06.002

Pan, X., and Hamilton, A. F. D. C. (2018). Why and how to use virtual reality to study human social interaction: The challenges of exploring a new research landscape. *British Journal of Psychology*, 109(3), 395–417. https://doi.org/10.1111/bjop.12290

Pinto, L. D. P. F., Silva, H. L., Kuriya, S. P., Maçaira, P. M., Cyrino Oliveira, F. L., Cruz, A. G., Esmerino E.A., and Freitas, M. Q. (2018). Understanding perceptions and beliefs about different types of fermented milks through the application of projective techniques: A case study using Haire's shopping list and free word association. *Journal of Sensory Studies*, 33(3), e12326. https://doi.org/10.1111/joss.12326

Piotrowski, C., Keller, J. W., and Ogawa, T. (1993). Projective techniques: An international perspective. *Psychological Reports*, 72(1), 179–182.

Porath, S. (2011), Text messaging and teenagers: A review of the literature. *Journal of the Research Center for Educational Technology (RCET),* 7(2), 86–99.

Rabin, A. I. (1960). Projective methods and projection in children. In A. I. Rabin and M. R. Haworth (eds), *Projective Techniques with Children* (pp. 2–13). New York: Grune & Stratton.

Rook, D. W. (1985). The ritual dimension of consumer behavior. *Journal of Consumer Research*, 12(3), 251–264.

Sakatani, K. (2005). Harmony quest: An interdisciplinary arts-based project incorporating virtual reality. In Delacruz (ed.), *Visual Art Research*, Vol. 31. pp. 53–62. Champaign, IL: Visual Arts Research.

Schnack, A., Wright, M.J., and Elms, J. (2021). Investigating the impact of shopper personality on behaviour in immersive virtual reality store environments. *Journal of Retailing and Consumer Services*, 61, Article 102581. https://doi.org/10.1016/j.jretconser.2021.102581

Shaked, N. A. (2017). Avatars and virtual agents–relationship interfaces for the elderly. *Healthcare Technology Letters*, *4*(3), 83–87. https://doi.org/10.1049/htl.2017.0009

Smith, S. R., and Handler, L. (eds). (2007). *The Clinical Assessment of Children and Adolescents: A Practitioner's Handbook*. New York: Routledge.

Starr, R. G., and Fernandez, K.V. (2007). The Mindcam methodology: Perceiving through the native's eye. *Qualitative Market Research: An International Journal*, 10(2), 168–182. https://doi.org/10.1108/13522750710740835

Tingstad, V. (2013). Researching children in a digital age. In R. W. Belk and R. Llamas (eds.), *The Routledge Companion to Digital Consumption* (pp. 113–123), New York: Routledge.

Vallance, A. K., Hemani, A., Fernandez, V., Livingstone, D., McCusker, K., and Toro-Troconis, M. (2014). Using virtual worlds for role play simulation in child and adolescent psychiatry: An evaluation study. *The Psychiatric Bulletin*, 38(5), 204–210. https://doi.org/10.1192/pb.bp.113.044396

Venkatesh, A., and Dunkle, D. (2013). Digitizing physical objects in the home. In R. W. Belk, and R. Llamas (eds). *The Routledge Companion to Digital Consumption* (pp. 13–27), London: Routledge. https://doi.org/10.4324/9780203105306.ch2

Xi, N., and Hamari, J. (2021). Shopping in virtual reality: A literature review and future agenda. *Journal of Business Research*, 134, 37–58. https://doi.org/10.1016/j.jbusres.2021.04.075

Zaltman, G. (1996). Metaphorically speaking. *Marketing Research,* 8(2), 13.