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Media Exposure Influences Cognition and the Informational Content of Texts

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ABSTRACT (ENGLISH)

In a world where online-media plays an ever increasingly important role supplanting increasingly more aspects of real-life experiences, the question is raised on how the particular kind of media a person is exposed to influences the retelling of the experience (language production) and its mental representation (conceptualization). In this experiment, participants gave written route directions for a route they got to know through different media. Four conditions were tested: 1) a video of the route 2) a plan of the area complemented with photographs of the surroundings and 3) a multimedia combination of 1) and 2). A baseline was provided by 4) walking the route in the real world (no-media condition). The participants (N=88) were adult native German speakers. The texts were compared to assess text length, number of landmarks used, and the specifications provided by them. Results show that participants exposed to video routes produced texts similar to those texts based on real life experiences. Experiencing the route only through a map produced shorter texts that contained fewer landmarks. Based on these results, the map can be interpreted to be the least natural experience. Further results showed that decision points are easily identified in the real world or using a plan, but less so based only on a video, since the first-person perspective of the video obstructs the decision points or passes them too quickly. The findings suggest that exposure to different media leads to different cognitive maps that in turn lead to different route directions.

Keywords: Landmarks, route directions, media, video, plan

EXTENDED ABSTRACT

Media experiences play an increasingly central role in the life of modern people, to the detriment of experiences in the real world. This raises the question of whether these experiences are equivalent with respect to the mental representation formed from the real-world experience. Triangulating from contradictory theories of transactive and autobiographical memory that make contrasting predictions on the effects of media (sometimes found to improve and sometimes worsen memory); in this study media is hypothesized to frame the experiences and thus to affect mental representation. The more immersive the media experience, the more informative and linguistically coherent is the resulting retelling of the experience expected to be. The language output is used to access the mental representation that in turn is based on memory. Route directions were chosen as an adequate task since it is a linguistically well described, not emotionally charged but rather instrumentalized genre that permits the control of previous knowledge. Along the route there are critical spots (strong bends, blockages, many possibilities for further advancing) where it is advisable to re-orient the imaginary walker to ensure that he stays on the planed route. In route directions these critical spots are typically marked by placing landmarks: Choosing a visible and recognizable object of manageable size to anchor the localization or movement to specific coordinates in the environment. A database of 88 route directions was collected empirically by means of an experiment. The same route was presented to adult German native speakers (22 participants per condition) that gave written route directions in German after being exposed to different randomly assigned media conditions (manipulated independent variable). The tested media were a video from a first-person perspective, an aerial plan of the route complemented with still images of the route, and a combination of both with a moving dot in the plan showing the current position in the video (multimedia condition). The baseline was provided by the prototypical experience of walking the route in the real world (no-media condition). The following hypothesis were tested: Firstly that texts composed after media-mediated experiences will not be as successful in preventing the hearer from getting lost on the way; secondly, that it is more difficult for the speaker to recognize these critical spots when relying on perspective-fixing, not self-paced media in contrast to experiencing the route in the real world (prototypical experience used as a control). Lastly, that more realistic experiences will produce more informative and coherent texts. Results of the randomized experiment support the hypotheses in part. The placement of landmarks at the different segments of the route was operationalized to account for the conceptualization of the surroundings. Results show that the plan

condition is less likely to successfully lead the hearer to the final goal. The video and multimedia conditions are as well suited as the real experience to form a mental representation of the route. Blockages along the route are more difficult to identify based on an aerial view. The plan condition also results in less informative texts (fewer landmarks and fewer specifications), but not less coherent texts than in other conditions. The informative content and linguistic coherence of texts produced after exposure to the video and multimedia conditions can even outperform the control (real world condition). This is interpreted as a positive effect on memory from immersive media being used repeatedly. In the multimedia condition the drawbacks from the field-of-view of the video are counterbalanced by combining it with another media that uses an aerial perspective (the plan), resulting in an even more comprehensive experience than possible in the real world. The findings suggest that different experiences lead to different cognitive maps, that in turn lead to different texts via different conceptualizations. Apparently, the more natural the experience, the longer the produced texts and the more landmarks are used in the texts. This work contributes to an emergent literature on the role of media in shaping our representation and understanding of reality.

1. Introduction

Visual media, such as photographs, videos or maps, allows us to outsource our memory. Although one could argue that the outsourcing of memory load in some form or other has taken place since the invention of writing (c. 3500 - 3000 BCE), it is only in the last century, when technological advances have made possible increasingly immersive experiences in ever quicker succession, that an interest has appeared in the way technology affects the consolidation of knowledge and the shaping of memories. These technological advances have now reached a pinnacle of development in the digital era by making possible the combination of different media – the culmination of which now being augmented reality (AR) and virtual reality (VR). Additionally, it is commonly acknowledged that each particular media has its own constraints and particularities that determine which elements in a narrative or circumstance are focused or defocused by each media, e.g. the necessary arrangements made when adapting a book for the screen or for the stage. The media itself is not objective, rather it provides a framing narrative. Media can thus influence what is remembered and even, to some extent, what is forgotten. Different media can contain different and often competing viewpoints on how an event is narrated. Previous research has shown an ambivalent influence of media on memory – at times having the effect of reducing recall and at other times the effect of focusing attention and thus aiding memory. Beyond the effects of media on memory, there has not been much attention on how the knowledge and memories that speakers draw on for language production are mediated by the media the experiences were based on. In this explorative study, an attempt is made for the first time to ascertain this indirect influence of different media-mediated experiences on language output. For this purpose, a highly standardized task had to be selected, that:

1. Permits the manipulation of previous knowledge of the participants;
2. Does not elicit strong emotional responses; and
3. Corresponds to a linguistically well-defined genre.

Route directions fulfill all of the said prerequisites: previous knowledge can be easily controlled by choosing a route unknown to all participants. It is possible to find culturally and emotionally neutral environments, e.g. a university building. Additionally, the linguistic structure and informational content of route directions has been well investigated, particularly for the German language (Delucchi Danhier, 2017; Klein, 1979; Wunderlich, 1978).

In this study, the kind of experience participants have of a route is varied by exposing them to different media reproducing the same route. Subsequently, participants were asked to solve the same task of giving written route directions for the experienced route. Compared to the real world experience (which is self-paced and allows the participant to direct their attention wherever they want) each media is expected to have a "framing" effect on the participants with its own advantages and drawbacks: Video provides the same pedestrian perspective as the real world, but is not self-paced and thus critical points along the route can escape the attention of the speaker. Maps provide an aerial perspective which has to be mentally adjusted to give a route direction but provides a much clearer layout of the route. A multimedia combination of a video and a map, while combining the advantages of both approaches, can also be more cognitively straining, since more information is displayed at the same time.

1.1. Theoretical framework

Route directions is a genre whose purpose is to guide a moving person to a goal in an environment. To fulfill this task, the speaker has to retrieve a mental map of the environment from memory, select a course that connects the starting point to the final goal, and formulate a set of instructions that prescribe the sequence of actions required in order to execute that course, step by step, in an appropriate manner. While progressing along the route, the communication partner, i.e. the hearer, collects direct perceptions of their environment that allows them to relate the instructions to the environment. In this way, route directions rely on the fact that the hearer is not only a moving agent but also a perceptive agent. The hearer, and at the same time the person who traverses space, is called the imaginary walker. The objective of the speaker giving the route directions is thus to deliver a set of ordered procedures and descriptions that allow another person to build an advanced model of the unfamiliar environment to be traversed. The discourse will therefore have features that facilitate the hearer's creation of such a mental representation: The chosen perspective will reflect a frontal view of the environment (pedestrian view or first-person view, rather than a birds-eye view or aerial view) (Schweizer, Hermann, Janzen, & Katz, 1998; Taylor & Tversky, 1992, 1996). The descriptions will include objects, topological relationships between objects or relationships between the objects and the imaginary walker. The actions and descriptions contained in the route direction and especially the way these actions and descriptions are linguistically integrated into a coherent text depend not only on the characteristics of the route but also on the native language of the speaker (Delucchi Danhier, 2017). Route directions are

thus a collection of prescribed actions that succeed one another in a specific order. In the absence of any explicit instructions the default action is to keep moving straight on (along the back-front axis). Depending of the route, to guide the imaginary walker though a succession of specific locations until the final goal, reorientation procedures may be required. Sites along the route where the imaginary walker has many options to continue are called decision points (Michon & Denis, 2001). At these points the reorientation of the imaginary walker is necessary to avoid him taking a wrong path. Entities along or near the route that are used as fixed reference points to describe movements or locations with respect to them are called *landmarks*. Habel (1987, 2001) goes as far as saying that landmarks have to be placed at decision points and points with a change of direction for the route directions to be successful.

It is usually assumed that at the beginning of the language production process some kind of conceptual preverbal message has to be produced of the situation to be verbalized (Levelt, 1989). This preverbal message is then given a linguistic and phonetic structure and finally articulated. Based on the linguistic output or behavioristic performance of the speakers, a reconstruction of the preverbal message can be attempted, also called conceptualization. The conceptualization is a highly complex process that includes segmenting the relevant saved information into units, selecting what to say from all the available information, structuring the selected information (choosing a perspective, sociolinguistic aspects like if it is a request or an order) and linearizing the information, i.e. ordering it in a certain succession, since language can usually only express one meaning at a time. While conceptualizing what to say, the speaker draws on different knowledge sources that provide representations in multimodal formats and generates propositional conceptual structures, one of the sources can be the conceptual map, another the mental lexicon, etc. In a quick, semi automatized process, the speaker decides how much information should be expressed, since the message should neither be over- nor under-informative. To find this middle ground, the speaker considers what he knows about the hearer's state of mind. This is known as common knowledge or common ground, i.e. what the speaker believes the listener knows about the world, prior the context of the discourse. As long as the speaker is not under duress – e.g. under time-pressure or operating only with partial information – speakers will take common ground into account. For example, speakers tend to make reference to objects using their most salient properties, and to take a deictic (self-oriented) perspective when ordering information since in an oral communication setting speaker and hearer prototypically stand close to each other. To make sure they are

understood, speakers tend to provide a little more information than is strictly necessary when naming objects (Horton & Keysar, 1996). This may be because it is easier for listeners to identify over-specified referents or because speakers tend to contrast features of the current referent object with the last focus of discourse of the same category.

1.2. State of the art

Previous research has contrasted which stories are being told (on social media, films, documentaries, news channels, newspapers, etc.) versus which stories are left silent for a particular event (Loftus & Banaji, 1989), showing the framing effect of media that may even end up being inscribed in the collective consciousness (collective memory). Previous research has shown conflicting evidence for the effects of relying on technology to remember or to shape experiences on memory — e.g. being dependent on a camera to record information. In an experiment (Henkel, 2014), undergraduates were asked to take note of objects in a museum, either by photographing them or by simply observing them. Upon being tested the next day, the participants were less accurate in recognizing the objects they had photographed compared to those they had only observed. Furthermore, they weren't able to answer as many questions about the objects' visual details for the photographed objects. This is known as the photo-taking impairment effect: Taking photos of objects can reduce recall of objects and specific details about them because using media to provide a virtual storage to outsource memory, a so-called transactive memory system (Sparrow, Liu, & Wegner, 2011), leads to people feeling that they didn't need to attend to the experience fully in the moment, since they would have future access to it.

On the other hand, media-packaged experiences can create opportunities for rehearsal and meaning-making: People have the possibility to experience the same thing many times and also take time to reflect on the experiences in a self-timed fashion. Furthermore, rich multimedial, textual and visual representations can serve as effective cues to facilitate retention and recall of memories (Stevens, Abowd, Truong, & Vollmer, 2003). At this point, one has to be careful conflating general medial representation with autobiographical history, which is highly emotionally laden (Nelson & Fivush, 2004), since emotion has been shown to facilitate memory formation and consolidation (McGaugh, 2003). Nevertheless, the re-experience though multimedia, e.g. on social media, predicted better memory recall (Qi, Dasom & Yubo, 2017) even after controlling for social factors such as personal importance or emotional intensity (Wang, Lee, & Hou, 2017).

1.3. Hypothesis

Starting from the general hypothesis that it is possible to reconstruct the conceptualization from the language output of the speaker, the following hypothesis were proposed for the effect of presentation media on the conceptualization and verbalization of route directions:

1. The golden standard for an experience is hypothesized to be the real world experience of walking the route, since this is the experience that allows participants the most control over the experience itself. Consequently, we expect the real world should offer the best conditions for building a mental map of the route and consequently the texts with the highest probability of actually guiding the hearer to the final goal. The media-mediated experiences should still allow for some participants to successfully solve the task, but the produced texts are expected to be incomplete or to contain mistakes more often.
2. Each media is expected to have a framing effect that should be reflected in the informational content of the texts, specifically, the number and the kind of landmarks and their placement along the route. The most dramatical differences are expected at decision points.
3. More immersive experiences should lead to a more adequate linguistic output (taking the real world as a baseline), measured using the number of landmarks, number of specifications of these landmarks and number of landmarks repeatedly named in the texts (as a loose measure of text coherence and informational density of the texts).

2. Methods

An experiment was conducted to collect a corpus of 88 written route directions describing the same route after experiencing four different media-experiencing conditions. Thus, the experimentally controlled factor was the exposure to media between-subjects for creating the cognitive plan of the route. The media experienced were: video, a plan complemented with photos, a combination of both, or the real world (baseline; no media condition). This section explains the experimental procedure, the specifics of the participating subjects and the preparation and coding of the data. Given the relative novelty of the research, whilst existing literature informed, it could not offer applicable variable operationalizations. Thus, original research stimuli and coding

variables were developed based on similar research. This facilitated a precise alignment between empirical variables and the theorized hypotheses.

2.1. Experimental procedure

Participants read instructions explaining that they were participating in a way-finding experiment. The task was to first familiarize themselves with the route though the media they had been randomly assigned to and then to write a text guiding a person with no previous knowledge of the surroundings to the predetermined goal. Participants were told that somebody else would actually try to follow their written instructions on site. The participants were told in advance that the surroundings corresponded to a university building and also where the starting position (office 108) and the final destination (classroom 20) of the route were located. There was no time limit given for familiarizing themselves with the route, i.e. the participants could walk the route or watch the video or the plan for as long as they deemed necessary. After the participants declared themselves ready, the experimenter stated the experimental question: "*Wie komme ich zum Seminarraum 20?*" (*How do I get to classroom 20?*). The participants then wrote down the route directions on a sheet of paper. Finally, participants were asked to complete a questionnaire with biographical information. All participants were tested individually and in their mother tongue. All media was presented on a computer screen.

2.2. Stimuli

All participants in all conditions gave written route directions for the same route. **Figure 1** gives an overview of the route and its key characteristics. It has a length of about 60 meters and traverses a series of corridors, doors and a hall to get from the predefined starting point (marked [0]) to the final goal (marked [14]). Along the route there are five decision points ([2], [4], [8], [10] and [11]) and it is necessary to change directions five times (marked [2] [5], [9], [10] and [13]).

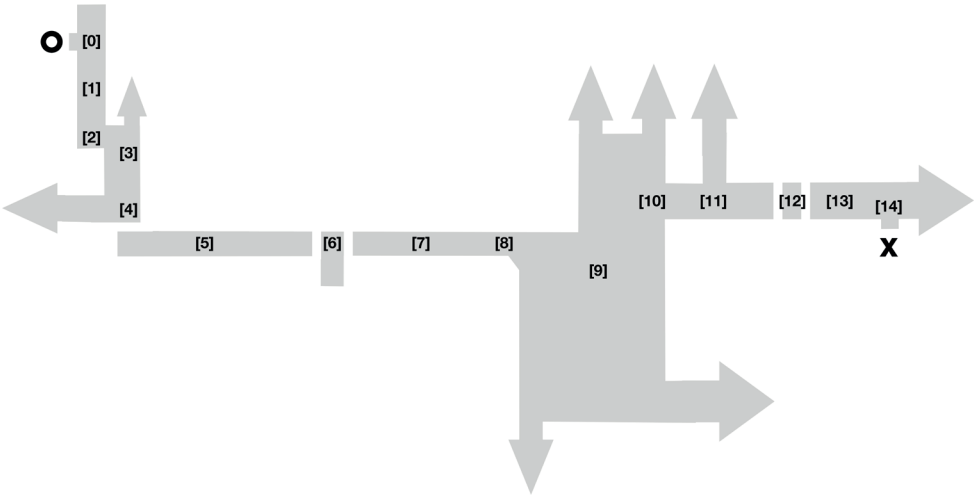

Figure 1: Schematic overview of the route with starting point (o), final goal (x) and numbered segments

The manipulated experimental conditions correspond to the media the participants were exposed to:

1) **Real world:** Traversing the route on site in the Theoretikum building of the University of Heidelberg (Germany). Participants were placed at the starting point, oriented toward the trajectory and accompanied to the final goal to avoid getting lost on the way.
2) **Video:** A full color video showing the progression along the route from the first-person perspective. The video had a total duration of 1 minute.
3) **Plan:** A simplified architectural plan of the relevant part of the building from an aerial perspective showing the corridors with its possible exits, the doors to the rooms along the route and some salient objects along the route schematically marked on the map. The plan was complemented with still images of scenes that appeared successively along the route and were connected with a line to the corresponding position from where the photographs were shot.
4) **Multimedia:** The video and the plan from the previous conditions combined. A moving dot showed the current view of the video on the map, linking both representations together.

Efforts were made while preparing the stimuli to provide media that was informatively

equivalent, differences were intrinsic to the different media type and corresponded to the manipulated variable. **Figure 2** offers a comparison of the presentation of the surroundings for the different media at some key points of the route.

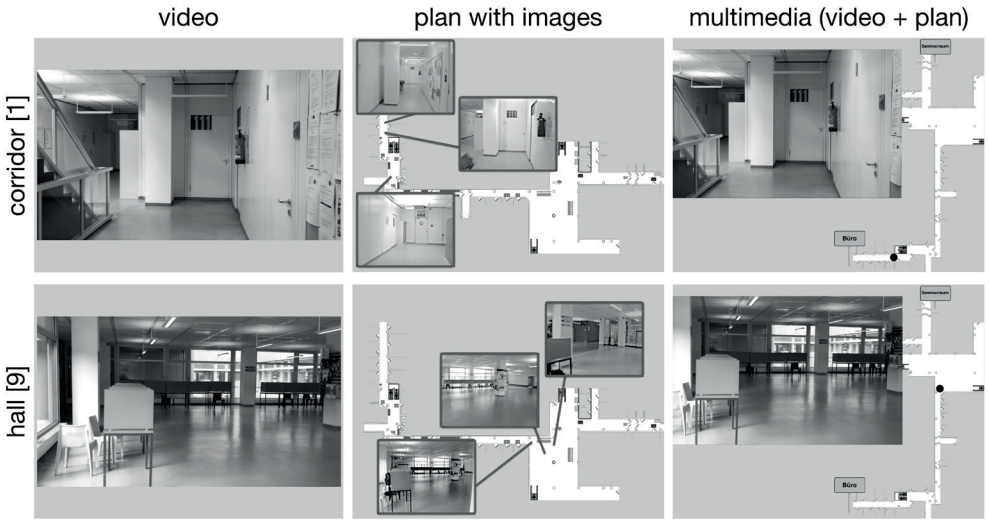

Figure 2: Key points of the route though the lenses of the three different media

2.3. Participants

A total of 88 different people participated on the experiment. All participants were unfamiliar with the surroundings of the route before the experiment took place. The route directions provided by the participants were therefore based on short term memory. When participants already know the route they have to describe, different strategies for information retrieval are activated (Atkinson & Shiffrin, 1968). The data was collected in Heidelberg and the Ruhr-Area, in Germany. An effort was made to recruit monolingual participants, but – since purely monolingual German-speaking participants are very difficult to come by – most had learned one foreign language (usually English) in a class-setting. Bilingual speakers were excluded from the study as well as participants who had lived abroad. Since in some contexts it has been shown that women refer to and make use of landmarks more readily than men do (Denis, 1997; Galea & Kimura, 1993), an effort was made to balance the participants with respect to gender, as well as to recruit preferably right-handed persons and to roughly match the age and instruction level of participants across conditions. **Figure 3** gives an overview of the key characteristics of the participants groups.

Condition	N			age		orientation		exposure
				$\bar{x}$ (years)	<20 2~ 3~ 4~ ≥50	vB B M G vG		$\bar{x}$ repetitions (time)
real world	22	11	0	26,0				1,6 circuit (6m)
multimedia	22	17	2	21,8				3,0 views (4m)
video	22	11	0	34,1				3,1 views (3m)
plan	22	11	2	34,4				1,0 view (5m)

Figure 3: Characterization of participants groups

2.4. Data preparation

The hand-written texts were transcribed and segmented in clauses numbered consecutively. A clause was considered to contain a maximum of one conjugated verb. Elliptical uses, subordinated clauses, and embedded subordinate clauses were counted as separate clauses.

The route was divided into discrete segments numbered sequentially following the trajectory of the route (a map with the numbered segments is shown in **Figure 1**, segments are referred to by their number in brackets). The rules for the division into segments were adapted from Delucchi Danhier (2017). Segments were defined as follows: (1) All landmarks conceptualized as a goal in a motion event were coded as even numbered segments; (2) The distance separating two consecutive even landmarks was defined as an uneven landmark. Segments can therefore either correspond to a specific position (even segments) or expand over a distance of several meters (uneven segments). This way, the route is segmented with maximal granularity based on the texts in the corpus themselves and therefore independent of the investigator. Participants, unaware of this segmentation, usually produce texts that do not refer to each and every segment.

The linguistic information contained in the texts was then mapped onto the segments of the route they referred to. A clause or part of a clause was considered to refer to an even segment if the landmark defining this segment was named (*walk along the corridor* [3] / and *cross the door* [4]). (2) If no reference to a landmark was made in the clause, the imaginary walker was considered to be located in the previous segment (*walk until the end of the corridor* [3]). In the majority of cases, there was a one-to-one mapping of clauses

to segments. In some cases, however, sentences could contain information that corresponded to two segments (*walk along the corridor* [3] *up to the door* [4]).

2.5. Operationalization

Since landmarks are considered a key component for constructing the cognitive map used during navigation (Michon & Denis, 2001) and thus play an important role in route directions, an operationalization was developed to ascertain the well-formedness of route directions from a navigational and linguistic point of view based on the use of landmarks in the texts. Habel (1987, 2001) affirms that landmarks have to be placed at decision points and changes of direction for the route directions to be successful. In an indoor environment, doorways are also crucial points. It is assumed very risky to not signal reorientation points and blockages on the route by neglecting to signal the point with a landmark. This criterium will be used as a criterium for quality control for assessing the route directions texts resulting from each experimental condition. In addition to a holistic appraisal of the suitability of the instructions for guiding somebody to the goal, the segmented texts were annotated for the following coding categories: (1) mentioned landmarks (2) segment of the route where the landmark is located and (3) specifications of these landmarks. The used definition of a landmark is that it is an object in the real world, that is used in the texts to locate another object or an action of the imaginary walker, acting as an anchor to the real world. According to this definition, a particular type of object, e.g. a door, is not considered a landmark across-the-board, but rather the deciding criteria is *how* the speaker conceptualized the object in the text. Anaphorical references to already named objects were also coded. As Specifications we coded all additional information about color, material, shape or appearance of an object conceptualized as a landmark that is meant to facilitate its recognition.

3. Findings

The analysis of the linguistic content of the texts as well as the underlying conceptualizations yielded quantitative and some qualitative results.

3.1. Informational accuracy

The overall informational accuracy of the texts was qualitatively coded by two independent coders using a binary coding system:

- **Accurate text:** A hearer attempting to follow these instructions in the real world would have a reasonable chance of arriving at the final goal.
- **Inaccurate text:** The instructions contain mistakes or lack crucial information that would probably cause the hearer to lose their way.

This first analysis corresponds to a holistic judgment of each as yet uncoded text. An inter-rater-reliability measure showed a substantial agreement (70%) between coders. **Table 1** summarizes the results.

Table 1: Texts in each condition deemed accurate

	Real world	Multimedia	Video	Plan
Accurate texts	18	17	14	8

A difference was found between the number of texts deemed informationally accurate in the different conditions: Texts composed after learning the route from the map were significantly less accurate than the control texts composed after walking the route in the real world, (χ2, (1), 9.40, $p < .05$). No significant difference was found between the control condition and the multimedia or video condition. The map condition was also significantly less accurate than the multimedia condition (χ2, (1), 7.50, $p < .05$).

3.2. Placement of landmarks

The speakers' choice of segment for landmarks location was analyzed. For this analysis rather than considering the total number of landmarks used by a speaker, it was only counted how many speakers placed any landmark at all on a particular segment (independently if they placed more than one or if they repeatedly referred to a particular landmark on many occasions). The results of this quality control for each segment along the route are shown in **Figure 4**. The start of the route [0] received more attention in the conditions with an aerial perspective (multimedia and plan), while it was disregarded in the conditions with a deictic first-person perspective (real world and video). The final goal received a lot of attention in all conditions, probably since it is the communicative function of this genre (Delucchi Danhier, 2017). Direction changes [5], [9], [10] received a high level of attention across-the-board. Doorways were given consistently less attention in the plan condition. Decision points [2], [3], [8], [10], [11] were given as much attention in the media conditions as in the real world or, in some cases, even more.

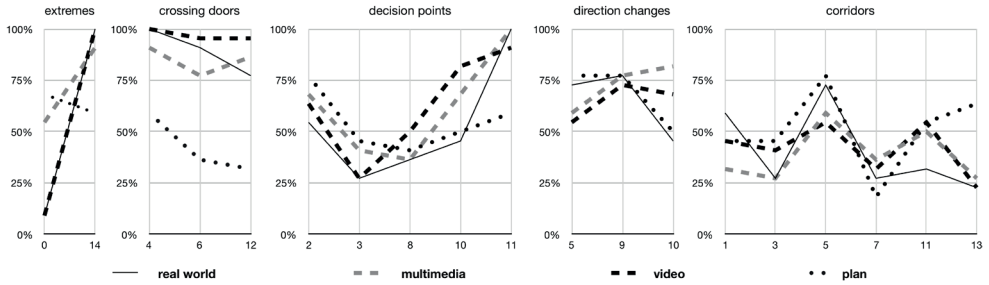

Figure 4: Percentage of speakers that placed at least one landmark in the segments: Segments were grouped by their physical properties (beginning and end of the route, segments where doorways had to be crossed, where the imaginary wanderer had to be reoriented, where there was a change of direction, and corridors).

3.3. Informational content

The results of the analysis regarding the informational content and coherence of the texts are presented in **Table 2**. Compared to the real world (M = 11,95; SD = 2,97), the multimedia (M = 15,14; SD = 3,18; t(42) = -3.09, p = 0.002) and the video (M = 14,64; SD = 4,55; t(42) = -2.31, p = 0.01) conditions resulted in longer texts (measured in clauses). The same pattern was found for the average total number of landmarks which is not surprising since longer texts provide more opportunities to use landmarks. Compared to the texts of the real-world condition (M = 13,45; SD = 2,97), the multimedia (M = 15,14; SD = 3,18; t(42) = -3.09, p = 0.002) and the video texts (M = 14,64; SD = 4,55; t(42) = -2.31, p = 0.01) contained more references to landmarks.

Regarding the coherence of texts, measured as references to landmarks already previously introduced in the text (re-references to LM), compared to the texts in real-world control condition (M = 3,09; SD = 2,22), the multimedia-texts (M = 6,32; SD = 2,73) showed a higher coherence; t(42) = -4.29, p = 0.0001, two-tailed. The coherence of texts in the video (M = 4,45; SD = 3,10) and plan conditions (M = 3,41; SD = 2,46) showed no significant difference to the control. The texts in the multimedia condition were also more coherent than in the video condition (t(42) = 2.11, p = 0.04, two-tailed) and in the plan condition (t(42) = 3.70, p = 0.0006, two-tailed).

The number of specifications in texts was significantly lower in the plan condition (M = 3,91; SD = 3,56) compared to the real-world controls (M = 6,36; SD = 3,43);

t(42) = 2,33; p = 0.01, two-tailed. There was no significant difference between the multimedia (M = 6,36; SD = 4,81) and the video conditions (M = 6,32; SD = 3,12) compared to the baseline.

Table 2: Text-length and informational context averages (landmark uses, repeated landmarks and specifications of landmarks)

Condition	Utterances	Landmarks	Re-reference to LM	Specifications
Real-world	11,95	13,45	3,09	6,36
Multimedia	15,14	16,64	6,32	7,95
Video	14,64	15,05	4,45	6,32
Plan	10,41	11,73	3,41	3,91

Especially in the multimedia, but also in the video condition, speakers tended to overperform (compared to the baseline provided by the real-world condition). The plan condition had values lower than the real-world control.

4. Discussion

The results of this study show that, at least for some participants, media experiences can replace the real-world experience of getting to know a route, building a cognitive map and accessing these memories to compose route directions. Out of the three media conditions, only multimedia achieved the success levels of the baseline in terms of realistically guiding the unexperienced hearer to the final goal, but in all conditions successful texts could be found. The texts resulting from media that present the experience from the first-person perspective are arguably even more informative than the ones composed after experiencing the route in real life. This can be explained as a result of the possibility of reliving the experience many times without some other distracting experiences in between, since to traverse the route again in the real world one has to first walk the route in the opposite direction first, which provides an experience with the opposite direction in the experience of the route, that could lead to some confusion in some participants). In the media conditions, an exact re-experience with no time delay is possible and even expected. Still, the experience in the real world manages to uphold its place as the golden standard, being the condition with the highest success rate. The success rate in the different conditions seems to be related to the perspective with which a particular media frames the experience, since speakers who had experiences that maintain the pedestrian perspective in line with the real world produce texts more similar to the control ones. This may be attributable to the additional cognitive step of

adapting the information provided in the areal perspective to the deictic perspective typical for route direction. In this sense, video based experiences that already offer the correct perspective appear to be more immersive.

Regarding the conceptualizations of the route for the different conditions, the quality of the cognitive map was operationalized via the capacity of the participants to recognize and signal critical spots along the route to the hearer (decision points, direction changes and door-crossings), since the lack of signalized landmarks on these critical segments would probably result in the imaginary walker getting lost. It must be noted, that although the signaling of these spots is typically accomplished by the placement of landmarks, it is also possible to produce a perfectly usable route direction without resorting to landmarks in every critical point along the route (speakers are still well advised to do so). The quality-control analysis revealed that the conditions of the real world, video and multimedia condition offer fairly equivalent experiences for the purpose of creating a mental representation of the route: They all place more importance on the goal than on the starting point, probably resulting from the first-person deictic perspective intrinsic to these experiences. They almost never fail to refer to the crossing of doorways, that are very visually marked in this media (and memorable at body-level, in the case of the real world if the doors have to me manually opened). Decision points are similarly attributed a high importance across all media. Only the decision point at segment [10] (locating the correct way out of the hall) receives significantly more attention in the video and multimedia conditions than in the real world and the plan conditions. This may be explained by the in the field-of-view constraint that video-based experiences provide, since it is the segment of the route with the broader width where the speaker would consequently profit the most from being able to freely look around in all directions. This combined with the salience of the object at [10] that is chosen as a landmark (an orange-painted wall with a large number written on it) makes the landmark all-dominating in the video-based experiences, while experiences with a more complete 360° view are less dominated by this. The plan condition produces the most differing conceptualizations: speakers in this condition often fail to report decision points and blockages (probably because the latter are less salient on the map) and over-emphasize the starting point of the route, while focusing less on the final goal somewhat. This latter finding is very untypical for route directions, where the asymmetry of the importance of the goal contrasted with the starting point has been linked to the communicative function of this kind of text (Delucchi Danhier, 2017). The results of the intuitive holistic coding and the linguistic analysis coincide: From all media-conditions,

the multimedia experience was considered to be the condition resulting in the most understandable route directions. The reason for this may lie in it having the least non-signaled decision points as well as the least non-signaled changes of direction, only surpassed by the real world (which was also the condition leading to the most successful texts).

The largest amount of details describing the landmarks (specifications) is found in the texts of the multimedia condition, even though the map provided in this condition did not provide extra information about the landmarks along the route in contrast to the plan provided in the plan condition, that was complemented by map-like symbols representing the objects along the route. This shows that images are a more efficient medium for transmitting information about objects than abstract representations of the objects, which is to be expected. The multimedia condition was thus the condition with the most specified landmarks, even though it was expected to be equivalent to the video in this regard and inferior to the real life-condition. A focusing effect or a heightened understanding of the lay-out of the route may have taken place in the multimedia condition.

The a priori assumption of the real world being the ultimate experience turned out to be wrong. Media is capable of imitating reality in a very convincing way. The assumption was based on the fact that the real world is where people have accumulated the most personal experience, and that is the most natural and self-timed experience. However, the texts based on the multimedia and video condition contained as much information or even more than the texts based on real life experience. This shows that, for some purposes, media-mediated experiences can even surpass reality, since it allows for experiences that would be impossible in the real world, e.g. the simultaneous presentation of the same information from two perspectives at the same time (multimedia condition). Participants seem to be able to manage several information channels using different perspectives at the same time without been cognitively overwhelmed, (even though it was not the goal of this experiment to test for this). It is telling that of the 22 participants in the multimedia condition, 18 of them reported to have used both the video and the map to plan their instructions (4 reported using only the video); while in the map condition only 8 participants reported using both the plan and the pictures to compose their text, while 14 participants reported using only the plan and disregarding the pictures. Judging from the results reported in this study, the immersion capability of media, understood as the capacity of media to imitate reality,

was found to be ordered as follows, from most similar to the real world to most different: multimedia, video and plan. The results of this experiment seem to support the results showing that media can be beneficial for the consolidation of mental representations and memory in general, even when the content is not emotionally charged. The conservative assumption at the beginning of the study that memory based on real life experience would offer the most comprehensible and detailed memories of the route is thus debunked.

5. Conclusion

In this explorative study, an attempt was made for the first time to ascertain the indirect influence of different media-mediated experiences on language output. Video-based conditions were probably the most successful ones because it is a media that is a fairly familiar experience for most of the participants, so they could deal with it reasonably well. In a future study the media consumption (daily hours of TV, console games, etc.) of participants should be controlled to account for different degrees of expertise in the interpretation of media-framed experiences (e.g. gamers vs. non-gamers). A planned continuation of this project will compare cohorts from different age groups within the experimental conditions. The percentage of the gamer population within a particular age bracket is expected to strongly inversely correlate with age. It would be interesting to create a similar task using VR as the medium, since this would add a media condition with a pedestrian perspective with a wider field-of-view, resulting in the most similar experience to the real world from the media tested so far. The monitor used in all the media conditions tested in this study all force a 60-degree field-of-view to the participant which is comparable to looking out of a window and thus presents a framed-experience where the viewer cannot direct their perception at will.

The more immersive a media experience is, i.e. the more similar to the real world, the more informative and linguistically coherent will the resulting texts be. If the media provides additional information unavailable in the real world, the speakers will even outperform the no-media condition in the linguistic measurements (used landmarks, redundant information, specifications of landmarks, text-length). The results of this study show that the increasing media-based perception of reality has a real repercussion on the mental representation and linguistic output of people. These influences of media on mental representation and retelling are only going to become more prominent with the massification of virtual and augmented reality.

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