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Telepresence and Attention: Secondary Task Reaction Time and Media Form

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Abstract

Attention to media has been widely studied. Often when studying attention, researchers have not distinguished to what the participants are attending – media form or media content of the presentation. This is also true of many studies on telepresence where the interaction of media form and content has been found to influence the sub-dimensions of telepresence reported by participants. However, several different elements of media form and content have been shown to be more helpful than others in bringing participants mediated worlds. In the current experiment, we use secondary task performance/reaction time (STRT) to measure attention to a media presentation and compare this attention measure to traditional self-report measures of Telepresence (Immersion, Social Reality, Spatial Presence, and Transportation) and Enjoyment. Further, we compare the STRT measure with the composite items of Telepresence-Immersion. The results indicate that STRT is a covariate, in the model with independent variables of Pace and Screen Size. Implications are discussed

Keywords---**Telepresence, Immersion, Attention, Secondary Task Reaction Time.**

1. Introduction

Telepresence has primarily been studied with self-report (e.g., pencil-and-paper) measures gathered after a media experience. While numerous researchers have commented on the necessity of more objective measures over the past decade [1-2], few have proven fruitful. This study will incorporate the concept of attention, measured by secondary task reaction time (STRT) in an attempt to clarify the self- report Telepresence measures. The current study presents an experiment that manipulated media form and content and measured STRT to investigate the relationship between attention and immersion in telepresence research.

2. Telepresence

The concept of telepresence was introduced in computer science and was directly related to the development of teleoperations. Minsky defined telepresence as emphasizing ―the importance of high-quality sensory feedback and suggests future instruments that will feel and work so much like our own hands that we won't notice any significant difference‖ [3, p. 45]. This is quite different than the definition presented in the 1990s by telepresence scholars.

For example, telepresence has been defined as ―the perceptual illusion of non-mediation‖ [4, para 2]; we make this point to stress that telepresence has primarily been focused on telepresence as delivery (i.e., mediated form) as opposed to the telepresence of the subject matter (i.e., mediated content). Elements in each modality ought to have independent and interactive impacts on a subject‘s telepresence.

In virtual reality, researchers attempt to maximize the feeling of ―realism‖ to ―fool‖ users into feeling the virtual environment is realistic. This distinction goes beyond acknowledging the roots of the telepresence, and is vital to the understanding of the underpinnings of the concept. As Communication scholars brought telepresence into the area of media [4-6], they brought with them this implicit assumption that experiential realism was what created sensations of telepresence. While this may be the goal in virtual reality settings, it is not necessarily true in our experience with popular media. If it were implicitly so, would we not pay to see the 4-story high images of fish, lions and Spiderman in an IMAX theater that clearly distort rather than mimic reality? Similarly, we would not watch Hollywood movies on our smart phones with their tiny objects and people.

The emphasis among virtual reality researchers on saturating the number of senses and the plausibility of the virtual environments (VEs) has resulted in media content being secondary in their research. There are media researchers who have included media content variables in their studies of telepresence [7-10], but the exploration of

the interaction of media form and content as influencing telepresence is limited. Ijsselsteijn and Riva argue that media content, as well as form, is critical to experiencing telepresence because the content is may keep media users ―interested and involved‖ [11, p.3]. Further, Bracken and Botta reported that content was more influential in creating sensations of telepresence [7].

2.1. Telepresence and the nature of reality, concepts, and the virtual

Pinker argues that all communication is the ability to paint a picture in another‘s mind [12]. Biocca refers to evolutionary primacy playing a role in shifts in telepresence [13]. He suggests that the ―ability to shift ones‘ spatial presence must be based on mechanisms that most likely served an evolutionary value‖ [13, p. 4]. He argues that we can conceive of situations when our ancestors needed to conceptualize/visualize or ―experience the presence‖ of a place, for example, to explain a past or plan a future action. Drawing a map in the dust or using a rock as symbol for a mountain has evolutionary value when planning a hunt or giving directions. Biocca suggests this ability might be linked to the beginning of self-consciousness as well as imbedding that self-consciousness within a social context.

Telepresence is based on our ability to conceptualize/visualize these types of images in our mind. There is an interaction between the real world imagery, the virtual imagery, and out mental imagery. Biocca suggests there are, then, three poles: physical space, mental imagery space, and ultimately (and humanly), virtual space [13]. For example, the hunter experiences a meadow with game. The hunter visualizes and remembers key features (i.e., conceptualizes the space), and then shares the conceptualized space with others using abstractions (e.g., drawings). This virtual space can now be shared by individuals who have not physically experienced the space, making actual plans in real physical space by using the virtual space and sharing the original hunter‘s concepts (i.e., mentalizations) of the space. By acknowledging that each individual has some capability to create images in their own mind of some actual (or even conceived of) physical space, and communicate these images to others through abstractions (e.g., words or other symbols), it explains the capability of the ease with which our minds accept the technological creation of environments (e.g., space) and experiences. Further, that we do this with actual environments and experiences allow us to move into ―created‖ ones and experience them as real. Our ability to represent imagery has obviously surpassed drawing in the dirt and we can now ―share‖ the images we create using cameras, computers, and software with millions.

Such a three-pole model asserts a case, as well, of potentially divided attention. When attention is divided across the poles (as it might be during initial learning), overall reported levels of telepresence is low. Consider the transference of knowledge about how to walk through an actual physical space full of pylons must be reconfigured mentally when learning how to drive a vehicle through them. Learning to control a boat through water or a plane through air must involve some unlearning about turning a car. During that learning period, telepresence would be low as attention is scattered across poles. One would see the a similar learning curve learning to use a video controller through a video game as the individual must merge physical experiences with conceptualized locomotion (controller) with the virtual space of the video game. Only once one has mastered the controller can presence ensue (with skill being a necessary causal condition).

Conversely, as spatial attention increases (attention at a given pole), an individual may not have the resources to maintain different spatial models (at other poles). Under conditions where action in space involves high spatial attention to sensory stimuli (e.g., learning a new motor task or during a fight-or-flight), spatial presence is focused and undivided on one consistent spatial model driven by physical or virtual space. When an individual‘s skills are being challenged whether in real space (e.g., driving in traffic during a snowstorm), in cognitive space (e.g., concentrating on detailed reading material) or in virtual space (e.g., being shot at in a combat centered video game), the level of mental energy required for processing of sensory cues approaches maximum. Any attempt to process away from that ―pole‖ could result in failure as processing other cues will result in the reduction of necessary processing within the focused ―pole.‖ In these cases individuals may report being in a state of high, undivided presence [13, p. 7].

Tasks and environments can place high or low demands on spatial attention. For example, learning to ride a bicycle may be highly demanding of attention compared to sitting stationary with no current task may be less demanding. In cases where that physical environment is not demanding of spatial attention individual may experience and become disengaged. A mental imagery space may dominate leading to an oscillation or division of presence across two spatial models the physical and the imagery space. The phenomenal experience reported in

self- report measures will be low physical presence [13, p. 8].

Biocca maps how media channels might be places within the three pole model. He places virtual reality at the extreme end of virtual space and flight/fight responses at the extreme end of physical space. The result is that there is not a direct relationship between levels of immersion and levels of telepresence [14] ―Thus, regardless of how immersive or impoverished the medium is, the experience of telepresence is determined by the quality of the physical, virtual, and /or mental spatial cues and the individual's awareness of them (Biocca, 2003)‖ (cited in Jones, [4] p. 41).

As mentioned earlier, the introduction of telepresence to the discipline of Communication brought many of the assumptions about realism and presence from how it was studied in virtual reality. How media users experience this phenomenon with popular media is different than in highly immersive virtual environments. The study of telepresence has been expanding in Communication while the various definitions of the concept continue to grow [15]. Therefore we offer the following definition as separate from the concept of telepresence employed in such contexts and focus on the experience of popular media.

In this study telepresence is defined as: requiring the use of technology and results in a psychological state in which media users voluntarily suspend the experience of mediation in order to feel a sense of connection with the mediated content they are using (i.e., a part of the action, connected to characters, involved in the story line). This state is often influenced by the expectation of the technology, the media content, and characteristics of the media user. A sense of telepresence is felt by media users when the technology becomes transparent in the interaction [16, p. 2].

2.2. Telepresence and Attention

Researchers have long discussed a link between attention and telepresence. Witmer and Singer state that they view telepresence as ―a normal awareness phenomenon that requires directed attention and is based in the interaction between sensory stimulation, environmental factors that encourage involvement and enable immersion, and internal tendencies to become involve‖ [17, p. 225]. They further attempt to conceptualize differences between attention, immersion, and involvement. Witmer and Singer link attention to focus. Focus refers to being aware of an entire environment and uses cues such as novelty to take in changes in the environment. In contrast, Witmer and Singer (1998) discuss focused attention as requiring most of one's attentional resources. This view is consistent with the Limited Capacity model [18]. Presence is seen as requiring both involvement and immersion[17]: Involvement is defined as ―a psychological state experienced as a consequence of focusing one's energy and attention on a coherent set of stimuli or meaningfully related activities and events‖ [17, p. 227]. Whereas, Immersion is defined as ― a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experience‖ [17, p. 227].

In contrast to the use of focus by Witmer and Singer, Weber, Tamborini, Wescott-Baker, & Kantor [19] incorporate the theory of flow into a model of enjoyment and cognitive synchronization. The model is based on attentional networks. Weber et al (2009) conceptualize attention ―as the means by which the brain chooses information (sensory or from previously formed mental model representations) for further processing‖ [20, p. 405]. Further Weber et al, see attention as multi-dimensional and refer to Posner, Inhoff, Friedrich and Cohen's (1987) triparte theory of attention: alerting, orienting, and executive processes.

In this theory, the first phase alerting is the part of the attentional network that increases and sustains arousal, which is thought to prepare for incoming stimuli [21]. Orienting is the selection of information that is perceived as relevant [18- 19]. Finally, the executive component of the network attention includes decision making, planning, and inhibitory control [19, 22]. The next section discusses measurement of attention.

2.2.1. Attention as Secondary Task Reaction Time. According Basil [23] Secondary Task Reaction Time (STRT) is capable of assessing ―attention, arousal, and involvement‖ [23, p. 93]. STRT is an objective measure that is based on the limited capacity model of attention [18]. The basic assumptions are that people distribute their perceptual and cognitive resources to survey and interpret the world around them. These resources are limited and therefore, when resources are allocated to a specific channel, less are available to process other channels. STRT measures attention on this same premise that when participants are involved in an activity or task, then less attention is available for the other activities (i.e., secondary tasks).

This method of measuring attention is useful for telepresence researchers because other researchers have

discussed how attention is an integral part of the presence-type experiences. [19, 24-25]

Hypothesis 1: Attention will be related to Telepresence (immersion).

2.3. Telepresence and Screen Size

Several studies have demonstrated that television can evoke sensations of telepresence in viewers [6, 26-27]. Even prior to these studies addressing telepresence, other studies found that under certain conditions viewers can respond to objects and people on the screen as if they were real [28-29].

During the 1990s and early 2000s investigations of television and telepresence focused on the increasing size of the home television screen. In the majority of studies larger screen sizes were associated with higher levels of the dependent variables including: television viewers report larger images as being more realistic [6]; increasing attention [30-32]); improving memory [5]; and as leading to higher levels of arousal [6, 28, 32]. Additionally, the positive relationships between screen size and dependent variable were also found for telepresence dimensions. Examples include higher levels of enjoyment [6], immersion [7], sensations of spatial presence [2], and perceived and social realism [26].

More recently, following the trend of smaller and portable media, a number of studies have explored the possibility that telepresence may be experienced when viewing small screens. Findings from studies of small screen studies include: small screens (3.9-inches) can elicit arousal when participants viewed news[33]. More directly related to telepresence, Bracken and Pettey found that participants reported higher levels of immersion when they viewed a film clip on an iPod (2.5-inches) than when viewing a larger screen television (32-inches) [8]. Additionally, Bracken, Pettey, Guha, and Rubenking who examined small screens and telepresence found participants reported experiencing telepresence with small screens [34]. This comparison is between two relatively small video sizes both viewed on a 15-inch laptop monitor. Based on the findings of these studies and the nature of the screens included in the study, the following research question is proposed:

RQ 1: Will there be a difference in telepresence between the larger and smaller video window presentations?

3. Pace

Pace has been linked to cognitive processing of audio/visual programming [35- 36]. Faster-paced clips are thought to require more cognitive energy. Lang‘s (1990; 1995; 2000) limited capacity model [18, 36-37] of mediated message processing (LC4MP) defines individuals as information processors who have a limited pool of mental resources from which to draw upon. This means that one can attend or process only so many things at the same time. Information processing of media messages contains three subprocesses: encoding, storage and retrieval. Individuals‘ limited mental capacity is distributed among these three subprocesses in a stimulus drive, bottom-up automatic way, or a viewer- oriented, top-down, controlled way [35]. Research demonstrates that structural features, such as pace of content, fast cuts, different camera angles (as well as some content features) can elicit an orienting response, or an involuntary response shifting attention to new or significant information in the content.

Studies manipulating pace have found that increasing pace can increase arousal and attention in media users [35]. There is a limit to how fast the pace of the presentation can be, past this threshold, media users become cognitively overloaded and can no longer process the media being presented.

The majority of studies on pace manipulate a presentation by creating a fast-paced (more cuts) and slower-paced (longer camera shots) versions of the same stimuli. However, some researchers argue that various genres are fast or slow-paced by definition. Choi and Lee have argued that definitions of programming genres can be linked to pace [39]. Specific genres have been found to have differing levels of pace:

Action-adventure children‘s television programming was found to have significantly faster pacing than education programming [40]. Action – adventure programming maintains a faster pace no matter the age of the target audience [41].

Bracken, Pettey, Guha, and Rubenking tested the impact of pace, audio delivery, and screen size on reported sensation of telepresence [34]. They found interactions between screen size and pace for immersion—with small screens and faster pace leading to higher levels of immersion. Pace was also found to impact social realism and spatial presence with larger images of slower content leading to higher levels of each DV being reported. Further, Bracken and Pettey found that viewers reported higher levels of immersion after watching video clips on iPods [8]. Specifically, participants reported

higher levels of immersion when watching conversation-driven (slow-paced) content on the smaller screen and action-driven (faster paced) content on a television. Since there are mixed results for pace and telepresence dimensions were are positing a two-tailed hypothesis for pace and immersion variables.

H2: Pace will influence reported levels of Telepresence.

4. Method

4.1. Participants

Undergraduate students were recruited from several social science courses to participate. The 120 subjects from introductory Communication classes were given credit from their instructors for participation. The majority of the group was female (n = 80).

4.2. Design

The overall MANOVA design of the current study utilizes a screen size by content/pacing (2 x 2) between-participant design with a covariate. Two independent variables were dichotomous: participants viewed either a large or small screen, either fast-paced action adventure content, or slower- paced, conversation-driven content. These 10-minute film clips were viewed by 120 participants with full Institutional Review Board approval. There were 12 audio distraction cues presented randomly throughout the 10 minute clip.

4.3. Stimulus

The video material was taken from the film Ronin. The movie released in 1998 was directed by John Frankenheimer and starred Robert De Niro. After viewing several movies that included both character conversational interaction and scenes with high action sequences without (or with minimal) character conversation, this movie was selected for three reasons:

First, it was not a well-known movie so most subjects would be unfamiliar with the context/story surrounding the 10 minute segment.

The director used long continuous shots during the character interaction (slower pacing) and multiple cuts (faster pacing) during the chase scene. Furthermore, the chase sequence was shot without computer generated imagery (CGI). This is noteworthy because even good CGI is not seamless, and the use of CGI might influence viewers‘ perceptions of realism.

The two 10-minute sequences were adjacent in the movie, with the planning (conversation sequence) immediately preceding the chase (action sequence). Moreover, the two sequences were self-contained and timed out to be within 24 seconds of each other.

The content (pace) of each clip was different. The action/chase clip was fast paced with frequent cuts and lots of movement on the screen. The conversation clip is presented in a much slower pace. The scenes feature longer shot lengths and slower transitions.

4.4. Independent Variable

4.4.1. Image Size. The first independent variable was image size (large versus small). All participants viewed the video clips on a 15.4-inch laptop computer; however, the image size on the computer was manipulated. One group of participants viewed 360 x 240 pixels. The other group watched the clips comprised of 1440 x 960 pixels. Both images were presented on an otherwise black computer screen.

4.4.2. Content/Pace. The second independent variable was content/pace. Content/pace was manipulated by having one group of participants watch the fast-paced/action clip and the other group watch the slow pace/conversation clip. The action clip featured a group of people firing guns at each other in a city street, followed by an extended car chase with a concluding gunfight (fast-paced). The conversation-driven clip contained most of the same characters sharing information and making plans (slow-paced).

4.4.3. Attention. Using Inquisit, we presented 12 audio distraction cues across the 10 minute video clip. The participants were instructed they would hear an audio distraction cue and when they hear it they should press either the spacebar or the mouse key. The participants were provided with a practice video clip featuring a comedian telling jokes and during this video had three practice distraction cues. The distraction cue was a trumpet playing music.

We calculated reaction time latency means for each of the 120 participants across the 12 distraction cues. We excluded 11 participants who never hit the space bar or mouse during the 10 minute video clip. Additionally, we found that many participants were slow to react first distract cues and therefore we dropped the first distraction cue and recalculated the latency means for the remaining 11 distraction cues across the remaining 109 participants.

This latency mean is what is used in the subsequent analyses.

4.5. Dependent Variables

4.5.1. Telepresence. The amount of telepresence experienced by the participants was measured using items from the multidimensional telepresence scale [26-27, 42] The telepresence items from the questionnaire were factor analyzed and resulted in for factors. These factors are similar to the subdimensions of telepresence identified by Lommbard and Ditton [4]. The factors are immersion, social realism, spatial presence, and transportation. Here transportation is consistent with a sense of ―being there‖ previously identified by Kim and Biocca [5]. For this study only items related to immersion were used.

4.5.2. Immersion. Immersion was measured by asking participants to respond to five statements using a scale from not at all (1) to very much (7). The items include ―How involving was the video?‖ ―How engaging was the story?‖ ‖ How exciting was the experience?‖ ―To what extent did you feel mentally immersed in the video?‖ (Cronbach‘s alpha = .86)

4.5.3. Social Realism. Social Realism was measured by asking participants to respond to three statements using a scale from not at all (1) to very much (7). The items include "The way the events occurred were a lot like the ways those events occur in the real world." "The events in the video could occur in the real world." "It is likely the events in the video would occur in the real world. (Cronbach‘s alpha = .87)

4.5.4. Spatial Realism. Spatial Realism was measured by asking participants to respond to three statements using a scale from not at all (1) to very much (7). The items include "How often did it feel as if you could reach out and touch objects or individuals in the experience?" "How often did an object heading toward you make you feel as if you should move?" "How much did it feel like the objects and events you viewed were all around you?" (Cronbach‘s alpha = .78)

4.5.5. Transportation. Transportation was measured by asking participants to respond to three statements using a scale from not at all (1) to very much (7). The items include "Did you ever feel that your body was in the room, but your mind was in the media experience?" "To what extent did you experience a sense of Being There inside the media experience?" "How much did your feel as though you were inside the media experience observing the events?" (Cronbach‘s alpha = .88)

4.5.6. Enjoyment. Enjoyment was measured by asking participants to respond to two statements using a scale from not at all (1) to very much (7). The items include ―Overall how satisfactory was the media experience?" "How enjoyable was the story?" (Cronbach‘s alpha = .58).

5. Results

As the Telepresence variables have been shown to be intercorrelated, a MANOVA was run with Predictors: Attention, Pace and Screen Size and the Dependent set as Immersion, Social Reality, Spatial, Transportation and Enjoyment. The overall test was significant (Pillai’s Trace .963; F = 523.82; df 5, 100; p<.001).

Hypothesis 1 predicted that Attention measures with STRT will be related to immersion aspects of telepresence. There was a significant relationship between Attention (as a covariate) and Telepresence Immersion (F = 10.33, p< .001; see Table 1).

RQ1 asked whether Screen Size will be related to Telepresence when looking at relatively similar video windows on a laptop. We see that only Transportation shows a significant relationship with Screen Size (F= 5.05; p<.05). While other studies have shown a variety of relationships to screen size, most commonly the differences between smaller and larger screens has been more dramatic than the comparison used in this study, which were both on the same computer screen (360 x 240 pixels versus 1440 x 960 pixels). That levels of Transportation were higher for the larger screen (M= 10.33; SD=3.95 versus M= 8.71; SD= 4.66) in this experimental setting make the impact of size important.

Hypothesis 2 predicted that Pace will impact the amount of telepresence reported by participants. There is a significant difference in social realism (F = 11.69, p < .000) and pace. Participants who watched the slower paced content reported higher levels of social realism than those who watched the faster paced content. This is essentially a manipulation check as participants noted that the slower paced piece was conversation and planning among the characters while the faster paced piece was an action, car chase, ―shoot-em ups.

Table 1 Multiple Analysis of Variance Table for Attention, Image Size and Pace

	Sum of Squares	df	Mean Square	F	
Attention					
Immersion	235.80	1.00	235.80	10.33	***
Social Reality	0.45	1.00	0.45	0.03	
Spatial	0.64	1.00	0.64	0.05	
Transportation	17.14	1.00	17.14	0.98	
Enjoy	8.84	1.00	8.84	1.02	
Pace					
Immersion	1.46	1.00	1.46	0.06	
Social Reality	170.24	1.00	170.24	11.69	***
Spatial	2.28	1.00	2.28	0.18	
Transportation	0.01	1.00	0.01	0.00	
Enjoy	0.06	1.00	0.06	0.01	
Screen Size					
Immersion	19.05	1.00	19.05	0.84	
Social Reality	9.40	1.00	9.40	0.65	
Spatial	0.00	1.00	0.00	0.00	
Transportation	88.74	1.00	88.74	5.05	*
Enjoy	16.82	1.00	16.82	1.94	

*Note: +p<.10; *p<.05; **p<.01; ***<.001*

5.1. Extended Analysis Results

As expected, attention (STRT) was correlated with the pencil-and paper measure of immersion (r =.30, p<.01). While significant, the linear relationship between Attention (STRT) and the paper and pencil immersion index accounted for less that 10 percent of the relationship (r2=.09). To further examine this relationship a correlation matrix was run to examine the relationship reaction time and the individual items of the immersion scale. The results show that attention (STRT) is correlated to the items that measure immersion. Specifically, there are negative correlations to items that inquire about involvement, engagement, excitement, and mental immersion. So, when a participant was involved, engaged, found the content exciting or was mentally immersed their reaction time was slower (See Table 2).

Table 2 Correlations between attention (STRT), immersion items and overall enjoyment

	Attention	Involve	Engage	Excite	Immerse	Enjoyment
Attention		-.22*	-.26**	-.27**	-.23*	-.09
Involve	-.22*		.66**	.53**	.60**	.30**
Engage	-.26**	.66**		.52**	.52**	.37**
Excite	-.27**	.53**	.52**		.62**	.29**
Immerse	-.23*	.60**	.52**	.62**		.19*
Enjoyment	-.09	.30**	.37**	.29**	.19*	

6. Discussion

This experiment sought to better understand how telepresence, specifically the sub-dimension - immersion, is related to Attention. Using STRT as an indicator of attention, we disentangled the conventional immersion index to examine the components relationship with a conventional non self-report measure of attention.

The correlations of the individual immersion items and reaction time is very intriguing both to telepresence and attention researchers. The correlations are significant and suggest that the variables have some commonality in what they measure. However, if the variables were measuring the same thing, you would expect the correlations to be higher. We see that generally the immersion items go better with one another than they do with the attention measure. These zero order relationships suggest that there may be distinctions between immersion, attention, and enjoyment, similar to those suggested by Witmer and Singer [17]. It also suggests that some of the telepresence measurements might be masking other relationships that have been occurring. An examination of the conventionally combined telepresence indices may bear fruit in our attempt to better define the concepts of telepresence.

Further, it appears that immersion is capturing element that pull media users into the media environment. Of the variables measured in this study it is the closest to attention. We feel that these results suggest that there may be emotional reactions that work independently with the

cognitive processing. There may be presentational elements that demand a reaction and that immersion appears to capture some of this reaction. People have instinctual responses to media environments and content.

Considering the orientation phase of attentional processing as discussed in Weber et al [19], based on this evidence we suggest that orientation is not a choice, that it is instinctual. We see this instinctual processing as a being a part of attentional processing that may allow us to better understand a larger part of attentional resources and how they contributed to sensations of telepresnece.

Additionally, this view is at least in part consistent with Reeves ideas about being there [43] where Steuer [44] quotes Reeves as saying being there is ―a combination of automatic perceptual processes, mindful direction of attention, and conscious processes such as narratization, all contribute toward our perceiving mediated experiences as if they were real‖

Conclusion

We believe that this aspect of attentional processing needs further investigation in Communication and Telepresence research. Finally, we think this may linkage may well elaborate the traditional Attentional Model in conventional media use, but also add a way for the conventional models to better assimilate the new media experiences that seem to emerge almost daily.

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