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A Survey of Virtual Reality Hygiene Practices

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ABSTRACT

The COVID-19 pandemic has increased awareness of hygiene and safety associated with Virtual Reality (VR) usage across many domains. Despite the growing need for solutions, the research on cleaning efficacy is severely lacking. To understand the impact of the issue we developed a survey to gather information on the hygiene practices in several domains. Survey results (n=41) indicate that hygiene practices vary, with many practitioners and researchers calling for access to empirically supported best practice guidelines.

1. INTRODUCTION

The COVID-19 pandemic has resulted in an increase in the use of digital technologies across health, education, training, and entertainment settings. In the clinical setting, there has been an increased use of telehealth, tablets, and mobile devices to communicate with patients and maintain ongoing care across inpatient, outpatient and community healthcare settings.

Hygiene and safety are always important to consider when using VR-headsets and controllers with multiple people, and even more so in the current COVID-19 climate (Stradford et al., 2021). Areas that pose a high safety risk include entertainment venues, training sessions, classroom education / simulation, research, and clinical settings. There are many scenarios in which VR-headsets are swapped between people, and/or VR-headsets are used daily by multiple people (e.g., when training with headsets). Previous research suggests that VR-headsets that are subjected to extended use by several people, leads to high levels of bacterial contamination that equals or exceeds that of computer keyboards in similar settings (Creel, Rinz-Jones, Jones, & Jackson, 2020). Indeed, bacteria and viruses can survive for hours to days on plastic, synthetic and leather surfaces (Suman et al., 2020). Besides universal hygienic solutions such as disinfection spray, alcohol and antibacterial, a range of specific options exist specifically for VR-headsets and controllers. These include face covers, face masks and UV-C decontamination technology. UVC light is used to disinfect a range of different objects through inactivation of bacteria and viruses.

Except for one case series study that evaluated a specific safety and sanitization protocol (Stradford et al., 2021), to our knowledge, there are currently no studies that evaluate the efficacy of these solutions, nor is there any empirically supported guidelines or standard approaches to cleaning VR-headsets and controllers. This leaves researchers and practitioners to define their own hygiene and safety protocols individually.

This research aimed to survey a range of stakeholders who use VR-headsets to find out more about the range of hygiene practices used and identify areas for future research.

2. METHODS

A survey was developed and internally evaluated to gather information on the hygiene practices undertaken by people who use VR-headsets across different settings. Participants were invited complete the survey via social media (Twitter, Facebook, LinkedIn, Discord) targeting virtual reality, education, rehabilitation, entertainment, training, and industry groups. The survey included basic demographic information to describe the participants, followed by questions about which types of VR systems were used, the purpose(s) VR was used for and then processes, practices and perceptions on the hygiene of VR-headsets.

3. RESULTS

Forty-one individuals from Denmark (n=22), USA (n=9), Norway (n=2), UK (n=2), and single respondents from Canada, Italy, India, Poland, and Sweden responded to the survey. Respondents included researchers (46%),

developers (18%), clinicians and practitioners (18%), and managers or consultants (18%) who used VR systems for education and training (43%), therapy or rehabilitation (38%), research (15%), or for entertainment (5%). Reported populations (a total of 500 weekly users) were (school) children, medical students, nurses, doctors, older adults, and patients with multiple diagnoses including Stroke. The most popular VR-headsets in use were Oculus Quest 2 (52%), Oculus Quest 1 (38%), Pico (38%), and HTC Vive (29%). Cleaning methods varied among respondents, but usually consisted of several solutions. Respondents used anti-bacterial wipes (73%), alcohol disinfecting wipes (56%), permanent face covers (leather/silicone) (39%), and UV-C light disinfection (27%). Sixty-four percent of the respondents stated that the COVID-19 pandemic made them change hygiene practices. Of those that changed practice, prior to COVID-19, respondents only cleaned occasionally with wipes/water (n=7), did not clean at all (n=4), only cleaned rarely (n=1), did not use UV-C (n=1), or shared VR-headsets (n=1). In terms of confidence in the cleaning practices, 3% were slightly confident, 26% were somewhat confident, 50% were fairly confident, and 21% were completely confident that their cleaning protocol were sufficient. Twenty respondents (49%) indicated that they did not have any concerns about their current cleaning protocol, with one participant stating, “*It has been approved by our Institution’s Infection Prevention and Control*” and another stating “*It is similar to what hospitals use to sanitize*”. One respondent had concerns that “*...the disinfectant may not work as well on the fabric elements of the headset and the lenses don't get cleaned with any sort of disinfectant due to likely damage to it....*”. Most respondents (81%) were unaware of research on hygienic practices concerning VR headsets, and respondents described the research in the area as e.g., “*fairly minimal*”, “*limited*” or “*very sparse*”. Respondents reported wanting to know more about the effectiveness of cleaning protocols and have access to best practice guidelines.

4. DISCUSSION

Most hygienic protocols were focused on the areas with skin contact (face and hand controllers), while not specifying potential contact points on the outside of the VR-headset nor concentration and amount of cleaning product applied. One respondent called for national guidelines and others remarked that it is the manufactures responsibility to use easily cleanable materials.

Stradford et al (2021) reported a revised VR-headset cleaning protocol implemented during COVID-19 for five participants enrolled in a clinical trial in the US. The revised cleaning protocol included cleaning of the foam headset cushion and full headset with antibacterial wipes, washing the cloth head strap with antibacterial soap, and cleaning the headset with UV-C light box specifically designed for VR-headset. Over a period of six months, none of the five participants or the three study-staff tested positive for COVID-19. The cleaning protocols outlined in the paper would require more specific evaluation to provide evidence of effectiveness.

The cleaning protocols described by respondents tended to use wipeable permanent face covers in place of the fabric covers that come standard with the VR-headset. Alcohol or anti-bacterial wipes were most commonly used to clean the VR-headset and hand controllers. UV-C light was used by 46% of respondents in addition to wiping the VR-headsets. UV-C light is proposed to decontaminates the headset, however, the efficacy of UV irradiation depends on many factors such as intensity, exposure time, lamp placement and air movement patterns, and should not be utilized alone (Memarzadeh, 2021). Further research is needed to define and evaluate suitable cleaning protocols for VR-headsets.

5. REFERENCES

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