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VR Users Are More Relaxed and Optimistic During COVID Lockdown than Others

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Abstract

Numerous studies have shown how the confinement period linked to the health situation of COVID-19 (SARS-CoV2) has been psychologically destructive for many people. These psychological disorders are generally linked to confinement and isolation. At the same time, virtual reality tools are becoming more popular, the level of immersion in cheap HMD (Head Mounted Display) helmets today allows access to a satisfactory level of presence. Our theory, widely supported by substantial literature, is that the regular use of immersive Virtual Reality during periods of confinement could allow users to better endure the psychological constraints. We observed the correlation between the weekly use of HMD Virtual Reality headsets, during the COVID-19 confinement period and the levels of well-being of users. Our study involved n = 56 participants divided into two groups of users and non-users of HMD headset. They answered 2 SWEMWBS and ONS questionnaires plus a social trust question. The results show a significant correlation between the use of virtual reality headset during COVID-19 lockdown and the level of relaxation and optimistic feeling but also a correlation between this use of VR (Virtual Reality) HMD and the feeling of being less close to others during the same period.

Keywords: lockdown, COVID-19, virtual reality, cognition, wellness, presence, HMD, metaverse

1. Introduction

Following the pandemic[1] caused by the Sars-CoV2 2019-2022, numerous studies have shown that whatever the country, the constraints of the different phases of lockdown have largely negatively influenced the mental health of many people (Grover et al., 2020; Ćosić et al., 2020). Young people under 35 and unemployed women seem more affected by this depression. (Pieh, C., Budimir, & Probst, 2020). Recently, the scientific literature has reported the positive effect of the use of new technologies, such as social networks, during the lockdown (Cauberghe et al., 2020), allowing young adults to experience a better environment of psychological constraints. It therefore seems that the use of new technology could allow their user to temporarily escape the constraints of lockdown and thus to be less prone to mental health disorders. Starting from the postulate that cognitive behavioral interactions can be linked to emotional conditioning (Damasio, 2000), we assume that in an ABC (Antecedent-Behavior-Consequence) scheme, the stimuli introduced by VR (Virtual reality), consciously and unconsciously allow users to provoke the conditions for a positive emotional state change, in a lockdown context which is in fact negative (Grover et al., 2020; Ćosić et al., 2020). The I² virtual reality combination of Immersion and Interaction (Fuchs, 2006), as well as the phenomenon of presence described by Slater (2018) as the level of immersion of the users which is subordinated to the addition of Pi, the Place Illusion: "*I am here!"* and PSi, Plausability: *"it's real!",* involve the use of many mental cognitive processes. These same cognitive processes linked to the functions of knowledge are used daily in the phenomena of regulation of moods and emotions. Immersive virtual reality, allowing the simulation of freewill and the freedom of action and wandering, could appear as an effective replacement solution for periods of lockdown, whether due to pandemics or for other social or health reasons.

[1] https://www.who.int/emergencies/diseases/novel-coronavirus-2019

Hypothesis

Our hypothesis is that the use of virtual reality technologies among young adults could, thanks to the phenomenon of telepresence (Sheridan, 1992) and presence (Slater, 2018), help to better cope with periods of lockdown linked to the pandemic. This is also supported by the fact that the experience of Flow (Csikszentmihalyi, 2014) generally experienced in video games (Chen, 2007), and virtual reality (Geslin, 2013), has also shown its effectiveness in maintaining good mental health during the Lockdown period linked to the COVID-19 pandemic (Sweeny, 2020). Research highlights an affective path in which VR immersion fostered positive emotions and positive cognitive value of different tasks (Makransky & Lilleholt, 2018). In the context of the significant development of consumer virtual reality tools, and VR Metaverse social Universe we believe that the use of immersive systems at a moderate cost can have a positive effect on the mental health of their users during the lockdown period.

VR, An affordable and accessible technology

It is common to think that the technology of Virtual reality is expensive and that consequently, in our study, the answers brought by the VR users on their wellbeing under Corona lockdown, should be observed regarding the differences in users' income. Because this one alone could explain a difference in well-being (Kahneman, & Deaton, 2010). The annual report of Perkins Coie (Augmented and Virtual reality survey report, 2020) commissioned by the XRA[1] clearly shows that the cost of the material is not an obstacle for mass adoption, only 11% of users report it as an obstacle, while 27% are reporting the lack of quality of the content available as the main issue. The Virtual Reality (VR) market is projected to grow from USD 6.1 billion in 2020 to USD 20.9 billion by 2025, with a constant Compound Annual Growth Rate (CAGR) of 27.9% (Researchandmarkets, 2020). The Researchandmarket report highlight the presence of a wide range of accessible VR products on the market: "*The availability of affordable VR devices, growing adoption of HMDs in different industries, the advancement of technologies and growing digitization, penetration of HMDs in gaming and entertainment sectors after COVID-19, and high investments in VR market are the key factors driving the VR market growth.*".

Telepresence & Presence

It is well known that the phenomena of "presence" (Sanchez-Vives, Maria, and Slater, 2004) observed in the use of virtual reality allows users to experience virtual experiences unconsciously as if we were living them in real life (Slater, 2009). In a context of confinement like prison, the use of libraries as tools of intellectual escape has shown very good results in maintaining a state of well-being of prisoners (Garner, 2019), generally all the processes allowing meditation, or telepresence will allow in a closed environment and under constraints, as for the prisoners a better well-being (Auty, Cope, & Liebling, 2017). The concept of Evoked Reality (ER) proposed by Dr. Jayesh S. Pillai (2013) links the different approaches to intellectual evasion that we use in our research. While reading and meditation can be linked to the principles of Self Evoked Reality (SER), that of using Virtual Reality involves Media Evoked Reality (MER) (Pillai, & al, 2013). Our thesis supports the idea that the beneficial effects of Self Evoked Reality on prisoners' well-being will be the same with the use of Media Evoked Reality using Virtual Reality HMDs during Sanitary Lockdown. Another experiment called covid-feelgood[2], is developed by Institute of Neurosciences (IN) of the University of Barcelona (2020), the goal is to measure whether daily smartphone use with Cardboard can help fight stress related to Coronavirus. This requires participants to observe a virtual garden daily for at least 10 minutes of contemplation. While observing the same garden for several weeks can be interesting, it seems relevant to us to measure the unconstrained use of multiple applications of Virtual Reality for the public in the context of lockdown. Indeed, according to Philippe Fuchs' definition of Virtual Reality, VR= I ²[Immersion and Interaction] (Fuchs, 2006), which is not the case with this exclusively contemplative experiment. In addition, immersion in Virtual Reality cannot be a constrained activity and must remain within the domain of free will (Morie, 2005; Geslin, 2013). Also, the study of the mental health of a group of HMD owners in Vivo using at least an hour each week their Virtual Reality system in interactive immersion compared to a control group, could make it possible to determine if Virtual Reality can help their user to better withstand the constraints of a sanitary lockdown.

[1] XRA: XR Association Represents headset and technology manufacturers across the broad XR industry, including Google, HTC VIVE, Facebook Oculus, Samsung, Sony Interactive Entertainment, and Microsoft.

[2] https://www.covidfeelgood.com/home

2. Methods

2.1 Online Process

VR research is traditionally done in a laboratory using laboratory equipment. The growing number of HMD owners now allows us to conduct our VR research remotely. Since research has shown that there is no significant difference between HMD owners recruited online, in university laboratories or with AMT[1], except for the number of hours played by female owners (Kelly, J. W., et al., 2021). We have chosen to recruit our HMD owners and our control group via social networks, on public and private specialized groups. Our sample has an underrepresentation of women, but studies show that this is also the case in samples from laboratory VR studies (Peck, Sockol, & Hancock, 2020). We have chosen to only use forms from HMDs owners using their own equipment for at least one hour per week. The form clarified to the user that the study was being conducted to study the potential effects of the use of Virtual Reality on the feeling of well-being during the lockdown or semi-lockdown period due to the COVID-19 virus. The recruits all declared to be over 18 years old, they have been informed that their identity will not appear in any report or publication and that all information relating to them will be treated as confidential. They accepted that the data recorded during this study may be kept in a database and be the subject of non-nominative computerized processing by the research unit. They have been informed of their right of access to these data provided by the "GDPR" law, exercised at any time with the research unit.

2.2 Questionnaire Subjective Semantics

We have developed a short questionnaire, which is completed in less than 5 minutes. This is the average response time we ask the people we interview on social networks. We therefore used the SWEMWBS questionnaire (Stewart-Brown, et al., 2009) Short Warwick–Edinburgh Mental Well-being Scale, this questionnaire has been validated for young people populations aged 15 -21 (McKay & Andretta, 2017; Ringdal et al., 2018) and for the general population (Ng Fat et al., 2017) it also has been strongly positively correlated with the WHO-5 questionnaire (Koushede et al., 2019). As reported by the Child Outcome Research Consortium (CORC) the SWEMWBS have been designed to be filed on paper or on a computer, this questionnaire uses 7 questions selected questions of the longest WEMWBS's 14 statements which is more designed to report the functioning than the feeling of wellbeing, these seven questions are: ("I've been feeling optimistic about the future", "I've been feeling useful", "I've been feeling relaxed", "I've been dealing with problems well "," I've been thinking clearly "," I've been feeling close to other people"," I've been able to make up my mind about things ") and completed by two other questions including one from the ONS[2].

Buidling our semantic questionnaire

Our subjective semantic questionnaire is built on a Likert scale of 5 (1: None of the time, 2: Rarely, 3: Some of the time, 4: Often, 5: All of the time) assessing the psychological wellbeing for individuals. The lower rate can be 7 and the higher 35. The SWEMWBS score interpretation is based on the Shah et al. study (2018) who report Scores of 7-17 represent probable depression or anxiety; Scores of 18-20 suggest possible depression or anxiety; 28 and above could represent high mental wellbeing. All of these thresholds are defined as subjective, but they help to better define the feeling of the population, overall, the higher the score the higher the mental well-being. The question from the ONS is: Overall, how happy did you feel yesterday? Where 0 is "not at all happy" and 10 is "completely happy". Results are divided in 4 categories Low, Medium, High and Very High. The "Low" category includes those responding 0 - 4 out of 10. The "Medium" category includes those responding 5 - 6 out of 10. The "High" category includes those responding 7 - 8 out of 10. The "Very High" category includes those responding 9 - 10 out of 10. The use of this question allows us to compare our results with that of the English population since the ONS reported public results on it in 2016.

3. Results

n=60 participants have been recruited on the web using social networks. All participants report to be in Lockdown or semi-lockdown with restriction of freedom for more than 1 month at the moment of filling in the form. They have answered the semantic subjective questionnaire via their web browser (Google Forms). We kept the user's IP temporarily to avoid bounced questionnaires, all the IPs have been erased after this verification. Regarding the time taken to answer the questionnaire (generally more than 12 minutes) we argue that this delay helped avoid fantasy answers. Four participants: 3 men and 1 woman report to suffer some psychiatric disorder

[1] Amazon's Mechanical Turk

[2] Office for national Statistic UK.

and their answers have been deleted. 9 women and 47 men responded. Women were 7.4% of the VR HMD Users and 25.9% of the HMD non-users. The average age was 39 years old. There was no significant difference in the result depending on age. Since a difference of emotional sensitivity in Virtual reality has been shown to be correlated by the participant's level of knowledge of the media (Geslin, Bouchard et al., 2011), we keep only those participants using HMD more than 1 hours per week in the HMD owner group to participate in the experiment. The VR Users group is composed of 28 adults who are using VR HMD at least one hour per week, and who are reporting to play video games an average of 5 Hours per week. The control group is composed of 28 adults who are reporting to play video games an average of 3.30 hours of video games weeks. Results report a significant difference in Genre regarding the state of relaxation, Women seem more relaxed than men in the study during Lockdown, sig < 0,03. and are also tendentially thinking they can trust most people. Since women are less present in the VR HMD users' group, those results enhance sensibly the significant results showing that the VR HMD users' group are feeling more relaxed than the control group (Fig1, Fig2, Fig3).

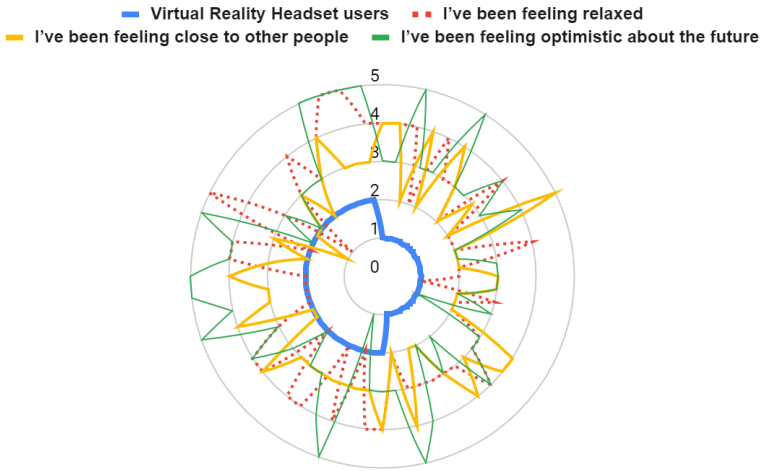

Figure 1. Test T Group Statistics

3.1 Independent Sample T test: Variable "I've Been Feeling Relaxed" Grouping Variable "HMD Owner"

Means between the two groups (Fig, 2) showed a high difference between the VR HMD users' group, mean=3.28, and the control group, mean=2.82

Group Statistics

	HMDownerYN	N	Mean	Std. Deviation	Std. Error Mean
Relaxed	1,00	28	2,8214	,86297	,16309
	2,00	28	3,2857	1,11744	,21118

Figure 2. Test T Group Statistics

Equal variances between variables isn't assumed, the difference is statistically significant (Fig, 3) F=4.15; p=0.04; t=-1.74 for ddl=54.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Relaxed	Equal variances assumed	4,154	,046	-1,740	54	,088	-,46429	,26682	-,99923	,07065
	Equal variances not assumed			-1,740	50,756	,088	-,46429	,26682	-1,00001	,07144

Figure 3. Independent Sample T test: Variable "I've been feeling relaxed" Grouping variable "HMD Owner"

3.2 Independent Sample T test: Variable "I've Been Feeling Optimistic" Grouping Variable "HMD Owner"

Means between the two groups (Fig, 4) showed the VR HMD users group, mean=3.64 to feel more optimistic than the control group, mean=3.10.

Group Statistics

	HMDownerYN	N	Mean	Std. Deviation	Std. Error Mean
FutureOptimistic	1,00	28	3,1071	,95604	,18068
	2,00	28	3,6429	1,16155	,21951

Figure 4. Test T Group Statistics

This difference is statistically significant with the result of the independent sample T test showing: F=4.16; p=0.04; t=-1.89 for ddl=54.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
FutureOptimistic	Equal variances assumed	4,167	,046	-1,884	54	,065	-,53571	,28431	-1,10571	,03428
	Equal variances not assumed			-1,884	52,075	,065	-,53571	,28431	-1,10620	,03477

Figure 5. Independent Sample T test: Variable "I've been feeling optimistic" Grouping variable "HMD Owner"

3.3 Independent Sample T test: Variable "I've Been Feeling Close to Other People" Grouping Variable "HMD Owner"

Difference of Means (Fig, 6) in regarding the feeling to be close to other people shown no difference in mean between the two groups

Group Statistics

	HMDownerYN	N	Mean	Std. Deviation	Std. Error Mean
CloseToPeople	1,00	28	2,8929	,95604	,18068
	2,00	28	2,8929	,73733	,13934

Figure 6. Test T Group Statistic

This difference in variable T test is statistically significant (Fig, 7) with Equal variances not assumed F=5.81; p=0.01; t=0.00 for ddl=54.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CloseToPeople	Equal variances assumed	5,811	,019	,000	54	1,000	,00000	,22817	-,45745	,45745
	Equal variances not assumed			,000	50,725	1,000	,00000	,22817	-,45812	,45812

Figure 7. Independent Sample T test: Variable "I've been feeling close to other people" Grouping variable "HMD Owner"

3.4 Independent Sample T test: Variable "SWEMWBS" Grouping variable "HMD Owner"

SWEMWBS results (Fig, 8) showed two mediums mean for the VR HMD User 24.8 and for the control group 22.4 reported to a scale between 5 to 35. The VR HMD user group seems to feel in a higher wellbeing state than the control group, but both results are close to the 18-20 score which could suggest possible depression or anxiety in the SWEMWBS score interpretation (Shah et al., 2018).

Group Statistics

	HMDownerYN	N	Mean	Std. Deviation	Std. Error Mean
SWEMWBS	1,00	28	22,4286	3,80476	,71903
	2,00	28	24,8929	3,72518	,70399

Figure 8. Test T Group Statistic

Even if means seems different (Fig, 9), Equal variances assumed F=0.016; p=0.89; t=-2.44 and ddl=54, mean the difference between the two groups isn't significant regarding the SWEMWBS global score.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SWEMWBS	Equal variances assumed	,016	,899	-2,449	54	,018	-2,46429	1,00629	-4,48177	-,44680
	Equal variances not assumed			-2,449	53,976	,018	-2,46429	1,00629	-4,48179	-,44678

Figure 9. Independent Sample T test: Variable "SWEMWBS" Grouping variable "HMD Owner"

The detailed "Group statistics" and "independent samples effects sizes" results are available in the chapter "9. Annexes" of this document.

4. Discussion

The results show a greater sense of relaxation in regular VR headset users, this may be due to the sense of telepresence and presence which allows one to virtually escape the stressful conditions of isolation or loss of freedom due to COVID-19 lockdown. Thus, thanks to immersive virtual reality headsets, users seem to be able to regain some of their ability to walk in open, large and unconstrained environments.

VR users are more optimistic

The trend results seem to show a higher proportion of optimistic people among virtual reality headset users. This optimism can be linked to the use of these VR helmets, but it can also correspond to a trend of the population of buyers of new technology, they could be more naturally oriented towards the future and in general constitute a form of progressive's users carrying a singularly optimistic transhumanist vision.

VR users feel more isolated

The results of this study also show that regular users of virtual reality headsets have the feeling of being less close to others during lockdown than people in the control group. Certainly, virtual reality could produce a phenomenon of withdrawal, but the offer of multiplayer video games is much less important today on the virtual reality distribution platforms than those of more traditional video games. The current development of several VR Metaverse introducing a very wide range of emotional communication between users should be able to erase this bias.

VR users' wellbeing seems to be higher

The results show a slight difference in the general scores on the SWEMWBS questionnaire, although they are not significant, it is interesting to note that these are to the advantage of regular users of HMD headsets during the sanitary lockdown situation.

The moderate but regular use of VR in games or simulation makes it possible to cognitively break out of the context of confinement to physical and social limitations by substitution of a virtual world where the only limits are those of the imagination of their designers and in where social interactions can be facilitated.

5. Conclusion

Despite the limitations of the study, it points the way for much new research into the weekly use of virtual reality as a psychological stabilizer. The induction of relaxation phenomena can combat the stress of isolation and stressful health lockdown situations but could also be used for the welfare of prisoners. The positivity of virtual reality headset users deserves to be studied in larger studies, including a higher number of users and considering the differences in respondents' income. Finally, it is necessary to better understand the feeling of distancing from others, which seems to be more important among weekly virtual reality headset users. Introducing massive research with the use of VR social Metaverse could provide further answers to these limitations. An in vitro study systematically using multi-user VR software in place of the current in Vivo study could shed new scientific light on this point. The study shows that the use of virtual reality headset to allow users to better withstand the constraints of future confinement could constitute a temporary public health solution, if it also implements social communication applications in virtual reality.

Conflict of interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article.

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Annexes

Group Statistics

	HMDownerYN	N	Mean	Std. Deviation	Std. Error Mean
Usefull	1,00	28	3,3214	,90487	,17100
	2,00	28	3,5000	,88192	,16667
DealingProblem	1,00	28	3,1429	,84828	,16031
	2,00	28	3,6786	,72283	,13660
ThinkingClear	1,00	28	3,6071	,78595	,14853
	2,00	28	4,0357	,79266	,14980
MakeUpMind	1,00	28	3,5357	,79266	,14980
	2,00	28	3,8571	,80343	,15183
LifeSatisfied	1,00	28	5,9286	1,92313	,36344
	2,00	28	6,4643	2,13406	,40330
TrustPeople	1,00	28	5,0357	1,81521	,34304
	2,00	28	6,1429	1,75782	,33220

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Usefull	Equal variances assumed	,144	,706	-,748	54	,458	-,17857	,23879	-,65731	,30017
	Equal variances not assumed			-,748	53,964	,458	-,17857	,23879	-,65732	,30018
DealingProblem	Equal variances assumed	,107	,745	-2,544	54	,014	-,53571	,21062	-,95798	-,11345
	Equal variances not assumed			-2,544	52,674	,014	-,53571	,21062	-,95822	-,11321
ThinkingClear	Equal variances assumed	,743	,393	-2,032	54	,047	-,42857	,21095	-,85151	-,00564
	Equal variances not assumed			-2,032	53,996	,047	-,42857	,21095	-,85151	-,00564
MakeUpMind	Equal variances assumed	,010	,921	-1,507	54	,138	-,32143	,21329	-,74905	,10619
	Equal variances not assumed			-1,507	53,990	,138	-,32143	,21329	-,74905	,10620
LifeSatisfied	Equal variances assumed	1,125	,294	-,987	54	,328	-,53571	,54290	-1,62416	,55273
	Equal variances not assumed			-,987	53,425	,328	-,53571	,54290	-1,62443	,55300
TrustPeople	Equal variances assumed	,206	,652	-2,318	54	,024	-1,10714	,47753	-2,06453	-,14976
	Equal variances not assumed			-2,318	53,944	,024	-1,10714	,47753	-2,06455	-,14973

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	Upper
Usefull	Cohen's d	,89347	-,200	-,724	,326
	Hedges' correction	,90612	-,197	-,714	,322
	Glass's delta	,88192	-,202	-,727	,326
DealingProblem	Cohen's d	,78806	-,680	-1,216	-,138
	Hedges' correction	,79922	-,670	-1,199	-,136
	Glass's delta	,72283	-,741	-1,295	-,176
ThinkingClear	Cohen's d	,78931	-,543	-1,074	-,007
	Hedges' correction	,80049	-,535	-1,059	-,007
	Glass's delta	,79266	-,541	-1,079	,007
MakeUpMind	Cohen's d	,79806	-,403	-,930	,128
	Hedges' correction	,80937	-,397	-,917	,127
	Glass's delta	,80343	-,400	-,931	,138
LifeSatisfied	Cohen's d	2,03134	-,264	-,789	,264
	Hedges' correction	2,06010	-,260	-,778	,260
	Glass's delta	2,13406	-,251	-,777	,279
TrustPeople	Cohen's d	1,78675	-,620	-1,154	-,080
	Hedges' correction	1,81205	-,611	-1,137	-,079
	Glass's delta	1,75782	-,630	-1,174	-,075

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.