Factors Associated With Videoconference Fatigue Among Healthcare Workers in a Tertiary Government Hospital

Alena Superficial, National Children's Hospital, Philippines
Elsie Lynn Locson, National Children's Hospital, Philippines
Jonna Marie Uy-Whang, National Children's Hospital, Philippines

The Asian Conference on Psychology & the Behavioral Sciences 2023
Official Conference Proceedings

Abstract
This study was conducted to determine the presence of videoconference fatigue (VCF) and the factors associated with it. It was approached through an analytic, cross-sectional research design and a non-probability convenience sampling. The respondent's demographic and videoconference (VC) profiles were obtained using a closed-ended questionnaire. A validated and reliable 15-item Zoom Exhaustion and Fatigue (ZEF) tool was also incorporated to this research instrument. This online survey tool was distributed to physicians and nurses employed at a tertiary government hospital. Data were analyzed using the between-group comparisons approach and univariate binary logistic regression. Out of the 237 respondents, 189 or 79.75%, experienced VCF. The majority experienced fatigue on all constructs with general (85.23%, n=202), motivational (79.75%, n=189), visual (68.78%, n=163), emotional (67.09%, n=159), and social (64.98%, n=154) fatigue. Furthermore, several key findings were made evident. VCF was more prevalent in younger age, medical officers (MOs), and single respondents. More frequent use of VCs and negative attitude increased the likelihood of VCF. This research provided us with new insights on the field of virtual meeting. Given the ubiquitous nature of VCs, the results of this study serve as a testament that blurred work-life boundaries contributes to the growing VCF phenomenon, ultimately increasing psychological stress.

Keywords: Healthcare Workers, Meeting Science, Pandemic, Videoconference Fatigue, Videoconferences, Virtual Meetings

CHAPTER I: INTRODUCTION

In 2020, the world was awakened by a highly contagious virus greeting everyone through the portals of their work spaces, leisure areas, and even their very own homes uninvited. Philippines has been hit hard by Covid-19 pandemic. The national healthcare system has been inundated. One such healthcare system is the National Children's Hospital (NCH), a pediatric tertiary hospital under the Department of Health (DOH), at the forefront of this unprecedented medical catastrophe. The gravity of this burden forced lifestyle changes, ultimately necessitating videoconferences (VCs) as a default platform to achieve work objectives and improve productivity. It is cost-effective and convenient. Adopting this has not been without a downside. it is not uncommon to hear healthcare workers (HCWs) complain about their mandated attendance on VCs in addition to their immediate onsite tasks, leaving them feeling drained and exhausted. Virtual meetings are not new technology but this trend has accelerated exponentially.[1] As a consequence, it has given rise to a newly observed phenomena called videoconference fatigue (VCF), popularly referred to as Zoom fatigue' by the British Broadcasting Corporation and National Geographic.[2, 3]

There are many ways to classify fatigue. For brevity, there is work fatigue characterized by extreme tiredness and reduced functional capacity that occurs in physical, mental, and emotional energy resources.[4] It is temporally tied to during-and-at-the-end-workday.[4] VCF shares the same characteristics, with a unique difference in that it occurs after engaging in videoconferences.[5,6]

Despite these emerging issues, scant academic researches have been undertaken to ascertain the prevalence, magnitude, scope, and impact of this emerging VCF phenomenon. Therefore, this study aims to determine the presence of videoconference fatigue (VCF) and factors associated with it.

A. Objectives

Primary Objective:
Determine the factors associated with VCF (in terms of general, visual, social, motivational, and emotional factors) among HCWs.

Secondary Objectives:
To determine (1) the profile of HCWs actively participating in VCs according to age, sex, marital status, work position, type of video platform used, type of VCs attended, frequency of VC use per week, duration of VC use per session and attitude towards VC, (2) the prevalence of VCF according to the factors, and (3) association of factors affecting VCF.

B. Significance of the Study

Exploring the impact of VCF phenomenon may provide directions on structurally constructing evidence-based measures to mitigate the fatigue.

C. Operational definitions

• **Videoconferences (VCs)** refer to online meetings mandatorily attended by HCWs over video forum platforms such as but not limited to Zoom, Facebook Messenger, Skype, FaceTime, Microsoft Teams, etc. These VCs are in the form of admitting conferences,

hospital audits, lectures, case report, grand-rounds, or research presentations, and committee meetings.

• **VC attitude** can be negative, neutral or positive towards VC usage.
Negative attitude: Score of 1 means participant does not enjoy participating on VCs.
Neutral attitude: Score of 2.
Positive attitude: Score of 3 means participant enjoys participating on VCs.

• **Videoconference fatigue (VCF)** is classified into 5 constructs (general, visual, social, motivational and emotional fatigue), each with 3 construct-specific response items as illustrated in the instrument tool.

CHAPTER II: REVIEW OF RELATED LITERATURE AND STUDIES

A. Related Literature/Studies

Fatigue as a Symptom

There have been many attempts to combat fatigue but its conceptual definition and causes remain vague and complex.[7] Fatigue is defined as a nonspecific manifestation of psychological and medical disorders characterized by a sense of weariness or loss of energy.[8] When fatigue continues beyond 6 months and left unchecked, this could lead to a serious debilitating disorder that substantially impairs normal function along with worsening body malaise even with minor activities (or post-exertional malaise) that cannot be resolved by sleep or rest.[7,9] This disorder is termed as the Chronic Fatigue Syndrome (CFS), a psychiatric condition we aim to avoid.[7,9] Knowing virtual meetings are likely to stay, predicted to take place in 75% of meetings by 2024, [10] prolonged use of this platform may exacerbate VCF, which is currently being pointed to as the newest addition to CFS' numerous causes.

Videoconference Fatigue as a Unique Construct

VCF is the exhaustion an individual feels after engaging in a VC. [5] Six months after the covid-pandemic struck, the field of VCF was explored qualitatively and quantitatively.[5] *Qualitative method* used open-ended questions related to VCF. Analysis of their results formed 3 themes 1) psychosomatic and psychological descriptions of the VC experience, 2) concept of time related to videoconferencing and its role on fatigue, and 3) in-meeting causes of VCF and common ways participants tried to reduce VCF. *Quantitative method* looked into the hourly trajectory of VCF. Online questionnaires, pivoted on when VCF occurs, were conducted for a total of nine hours each workday for 5 consecutive working days. Results revealed that VCs are associated with fatigue levels higher than one's expected fatigue trajectory at different times of the day.[5] Furthermore, formation of these questions and methods were significantly influenced by the Attention Restoration Theory (ART), a psychological perspective developed by Kaplan which builds on the assumption that energy is depleted by sustained attention, pertains to the effort required to focus attention and process information.[11] In a nutshell, ART proposes that connecting with nature has the capacity to restore attention after exerting mental energy.[11] Several studies have tested this theory and have proven an improved performance on attention-related tasks after one was exposed to nature.[12] Attendees reduced attention demands by utilizing ways they presume to alleviate VCF (enabling mute, turning camera off, and hide self), mirroring ART's postulation.[5] The nature of VCF was associated to fit within the broader domain of human

energy. [5,11] The framework of ART was brought into play as it (1) recognized that energy is influenced by more than typical work demands, [5, 13] and; (2) allowed investigators to explore that VCs are associated with fatigue due to a) increased sustained attention (how), b) timing or during certain times of day (when), and c) specific VCs characteristics (why)[5]. These factors primarily shaped their research questions. Results of the study underpin that VCF tends to occur closer in temporal proximity to the experience (temporal dimension) and ultimately that VCF is a unique construct. (Fig.1).

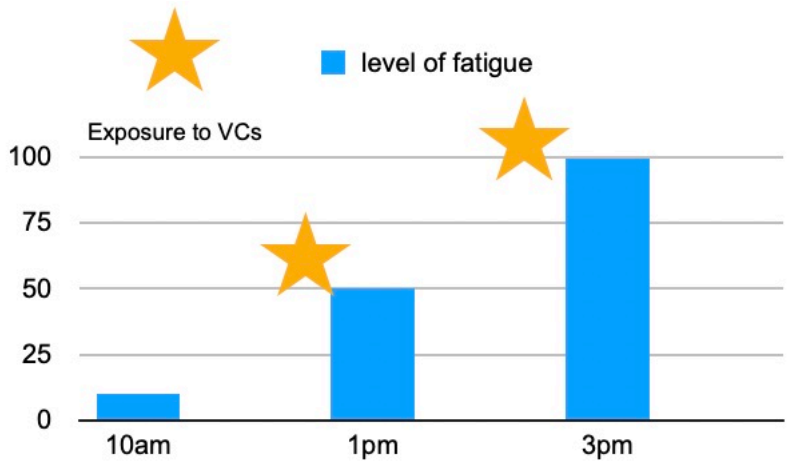

Fig. 1. Level of fatigue after exposed to VCs

Star indicates attendee has exposure to VCs. Columns height reflects level of fatigue.

Zoom Exhaustion and Fatigue Scale

One study has developed an online survey to measure fatigue that comes with VCs. [6] This questionnaire was formed on the assumption that there are 4 nonverbal elements (eye gaze, cognitive load, all day mirror, and physical mobility constraints) that may contribute to VCF, emphasizing that these elements are amplified in virtual interface as opposed to face-to-face (FTF) interactions.[14] Online meetings were presumed to increase load on **eye gaze** in that there is decreased interpersonal *distance* (referring to the space between the user and device monitor), increased *size* of the faces from the grid configuration, and increased *duration* of eye contact in zoom meetings. Bailenson cited Hall's theory on proxemics, a study of man's perception and use of space.[15,16] This anthropologist devoted his work on nonverbal communication and divided human distances into 4 zones. He classified intimate distance as anything below 46 cm (Fig.2).[15] It is estimated that the distance from the chin to forehead of the other person from a gadget screen is only approximately 13 cm, while the usual distance in FTF interactions is at least 50 cm.[14] The proximity of VC set up is unsettlingly exhausting, forcing people to behave in stressful ways for it defies that nature of patterned human territoriality.[15] The **cognitive overload** represents the need to (1) send extra cues (like nodding in an exaggerated way for a few extra seconds to signal agreement) and (2) comprehend limited receiving cues in an effort to be understood and get the right tune for interaction.[14] **All day mirror r**efers to the default self-view of the software which compels one to undergo the unavoidable, excessive self-evaluation.[14] Lastly, **reduced mobility** refers to the physical movements restricted by the camera's frustum, or the field of view of a virtual camera system.[14] This constraint complements theories that proposed people to produce more creative ideas with locomotion.[17, 18]

Inspired by these arguments, a 15-item questionnaire Zoom Fatigue and Exhaustion (ZEF) tool was designed to measure fatigue experienced by consumers after attending VCs.[6] The rigorous scale development process involved literature review and interviews that initially produced 49 items with 9 thematic constructs related to VCF.[6] Some themes, namely general fatigue, physical fatigue, mental fatigue, reduced motivation, and reduced activity, were adapted from the Multidimensional Fatigue Inventory.[19] Other themes included visual fatigue, vocal fatigue, emotional fatigue, and social fatigue. The research team recruited participants from Stanford University and various online sites such as Amazon, Mechanical Turk Worker System, and Lucid platform. After performing confirmatory factor analysis on this initial tool, the items were reduced to 15 items, ultimately forming 5 constructs to measure ZEF fatigue (general, visual, social, motivational, and emotional fatigue). In summary, the ZEF tool is comprised of questions that indicated the level of fatigue per domain (general, visual, social, motivational, and emotional fatigue). Each item was measured using a five-point Likert-type scale ranging from 1 = Not at all, 2 = Slightly, 3 = Moderately, 4 = Very, and 5 = extremely. This tool was adapted in this study.

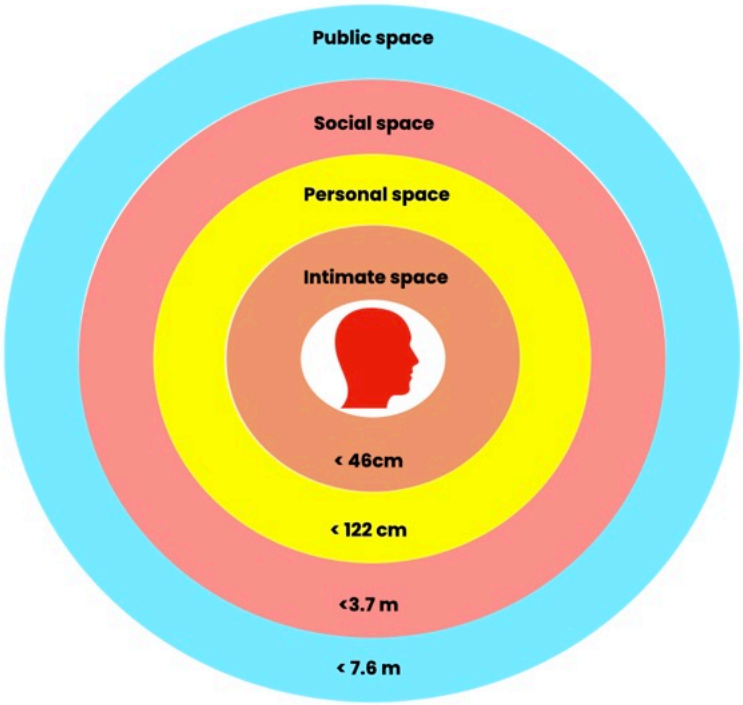

Figure 2. Interpersonal space. Hall, 1966.

B. Gap bridged by the study

Limited literatures have delved into the presence of VCF and developed tools to measure it but none investigated this phenomenon particularly on HCWs' well-being. This gap provides an avenue for research and must be undertaken to generate insights on how to reduce ill effects of VCF, preserve well-being of HCWs and ultimately protect sustained delivery of health care services.

C. Conceptual Framework

This study hypothesizes that the use of VC may cause fatigue in HCWs and several factors can possibly affect the degree of fatigue. Therefore, the conceptual framework involves the following elements: (1) VC use as the phenomenon; (2) Age, sex, marital status, work position, types of video platform used, types of VCs attended, frequency and duration of VC usage, and attitude as independent variables; and (3) videoconference fatigue as the dependent variable (Fig. 3).

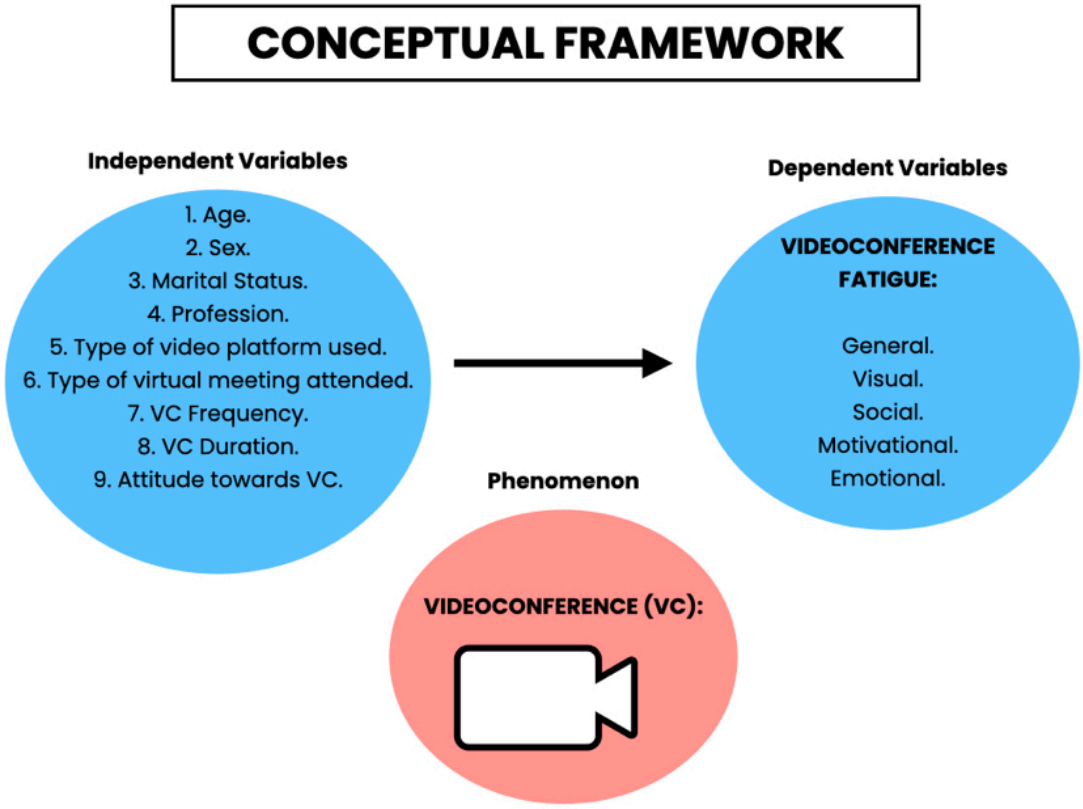

Figure 3.

CHAPTER III: RESEARCH DESIGN AND METHODOLOGY

1. Research Design

This study was approached through an analytic, cross-sectional research design and utilized an online survey tool composed of a closed-ended, quantitative set of questions. The tool was created from Google Form software and a link to this tool was shared through any mobile device.

2. Sources of Data

2. A. Sampling Design

Selection of participants was done through a non-probability, convenience sampling. This study involved physicians and nurses employed in NCH, Philippines. As of August 2021,

NCH has 224 doctors (155 full-time, 69 part time) and 201 nurses for a total of 425 employees in the field. Population was obtained from this group.

2. B. Sample size calculation

Sample size was calculated based on estimation of population, proportion of VCF among HCWs assumed to be 50%, there being no previous studies. With a maximum error of 5% and a reliability of 80% sample size required is a minimum of 167. This study was able to obtain 237 participants.

2. C. Inclusion Criteria

All participants must be employed in NCH and have been attending VCs for at least over 6 months. HCWs attending to VC at least once weekly are target subjects in this study.

2. D. Exclusion Criteria

Positions not required to attend regular VCs.

2. E. Withdrawal Criteria

Participants who opted not to answer some questions was withdrawn from this study.

3. Research Instrument

This study incorporated the Zoom Exhaustion and Fatigue (ZEF) tool, designed and developed by Stanford University researchers. Questions from this tool centered on VC fatigue and was categorized into 5 domains (general, visual, social, motivational, and emotional fatigue). Each domain allocated with 3 statements, adding up to a total of 15 items. Cronbach's alphas were calculated wherein each domain scored above 0.8 indicating a good scale reliability (general fatigue: $\alpha = .90$, visual fatigue: $\alpha = .89$, social fatigue: $\alpha = .88$, motivational fatigue: $\alpha = .85$, emotional fatigue: $\alpha = .88$). The average rating across the 15 items of ZEF score showed a reliability of $\alpha = .95$ proving the questionnaire to have high internal validity and good reliability.[6] This tool instructed respondents to indicate their level of VC fatigue using a 5-point Likert scale: 5 points = Extremely; 4 points = Very; 3 points = Moderately; 2 points = Slightly; and 1 point = Not at all. The total ZEF scores, summed up at the last section, range from 15 to 75. Classification of VCF based on the ZEF scoring is as follows: (a) No fatigue for those who scored 15 to 30 points; (b)Mild fatigue for 31 to 45 points; (c) moderate fatigue for 46 to 60 points; and (d) Severe fatigue for 61 to 75 scores. Total ZEF score may indicate presence of fatigue but not all constructs need to fulfill the presence of fatigue. Thus, each construct was further classified into no fatigue (ranging from 3 to 6 scores) and presence of fatigue (7 to 15 scores). VC usage frequency and duration were added to our research questionnaire along with other considered factors (age, sex, marital status, profession, type of video platform used, and type of virtual meetings attended). Based on Erikson's life cycle stages, age was divided into 3 groups namely, early-aged 21 to 39 years old, middle-aged 40 to 64 years old, and late-aged 65 years old and above.[7] *[Appendix A, Appendix B]*

4. Informed Consent Form (ICF)

The ICF consisted of the principal investigator's (PI) profile, the research background and its purpose, voluntary participation, procedures and protocol, duration, risks, benefits, reimbursements, and PI's contact details. Confidentiality for shared information was assured.

The right to withdraw was offered. Certificates of consents from both the researcher and research participant were provided prior to commencing the research proper.

5. Study Procedure

The online survey was distributed from August 10 to August 23, 2021 (over a year into the pandemic) among HCWs in NCH. Twenty (20) pilot participants were recruited via instant messaging through the PI's network. The initial survey was designed to assess readability of questionnaire items. Feedback from these respondents were accommodated virtually and FTF. Average completion time was 10 minutes. Test was validated by the PI prior to the survey proper.

Through Viber, Telegram, Facebook Messenger, and WhatsApp, Yahoo, Gmail, and Hotmail, an online survey link (https://docs.google.com/forms/d/e/1FAIpQLScc6bGx-MR4i7HhdlNa-w9PRDE75ChytwVJixmmIVbCYtvlhg/viewform?usp=sf_link or https://forms.gle/f5aDoSknv54Y27xx9) was distributed among the HCWs list obtained from the human resource department. The respondents were allowed to share the same link individually and through hospital group chats. Clicking the link commences the survey process. Respondents were asked to sign in using their google account, ensuring that the survey has not been answered twice by the same user. Upon individual request, a separate link was given to those without google account. The survey proper started with the ICF. It was stated that only NCH personnel can participate in the study. Clicking the "I consent" button directed the respondent to the 2nd section, the participant's demographic data. The profile on VC usage (the type of video platform used, type of virtual meetings attended, VC frequency per week, VC duration per session, and attitude towards VC) comprised the 3rd section. Participation was automatically declined for respondents who have not attended VCs for more than 6 months. The 4th section incorporated the ZEF tool. An option to disclose an email address was provided on the space before the survey's submit button for respondents interested on receiving a copy of results. Each respondent was assigned a number code. For participants found to have VCF, referral to a specialist was offered.

6. Data management and Analysis

Statistical analyses were performed using STATA Statistical Software, Version 13, College Station, TX: StataCorp LP. A p-value ≤ 0.05 was considered statistically significant. Descriptive statistics included frequency and percentage for nominal data, median and interquartile range for ordinal data, and mean and standard deviation for continuous-level variables. Comparative analyses of the data according to presence of overall VCF (with and without) were employed using Chi-Square Test of Homogeneity or Fisher's Exact Test, if the assumption of at least 5 expected frequencies per cell is not met, for nominal data; Mann-Whitney U Test for ordinal or non-normally-distributed continuous data; and, independent t-test for normally-distributed continuous data. The prevalence of VCF as an overall measure and of the different construct, was estimated using chi-square test exact binomial approach.[20] Univariate binary logistic regression analysis was conducted to determine odds or likelihood of developing the videoconference fatigue, as an overall measure and in the different facets or constructs, according to the different predictors or factors. [20] Binary logistic regression is an inferential statistical test which determines the association, measured using odds ratio, between an exposure or predictor of any data measurement and a with a binary, outcome variable. [20]

7. Ethical consideration

The study was reviewed and approved by NCH's Institutional Review Board (IRB). There were no conflicts of interest. All data were treated with utmost confidentiality.

CHAPTER IV: RESULTS

A total of 276 responses were received. Two hundred forty-seven (247) successfully submitted responses while 28 respondents abandoned the survey form or has withdrawn from the study. One did not consent to participate. Of the 247 who successfully submitted responses, ten (10) were excluded for **not** attending VCs for more than 6 months or more than once a week, leaving 237 eligible HCWs for this study.

Table 1 illustrates the demographic profile of the respondents according to the VCF status. It is noted that the mean age of the respondents was 36.47 years old (SD=8.80), with most of them being between 21 to 39 years old (73.84%). Results also showed that majority of the respondents were female (79.75%), single (57.38%), and medical officer III (31.22%). Results also showed that 41.35% of the respondents had a history of COVID-19 infection. Comparative analyses indicated that the mean age of the respondents was significantly higher among those without VCF ($\overline{x}$=42.02, SD=11.12), and that the proportion of those without VCF was significantly higher among those who were 40 – 64 years old (45.83%). The comparison of those with VCF was significantly higher among those who were single (63.49%). Similarly, the proportion of respondent with VCF was significantly higher among medical officers III (35.98%).

The VC characteristics of the respondents according to the VCF status is depicted in Table 2. The most commonly utilized VC platforms were Zoom (100%), Google Meet (33.05%), Facebook Messenger (22.36%), and Microsoft Teams (18.57%). Comparative analyses indicated that the proportion of respondents who did not have VCF used Facebook Messenger (33.33%), Microsoft Teams (31.25%), and Google Meet (50.0%). The most common type of VCs attended by the respondents were lectures (96.62%), hospital audits (82.28%), case presentations or grand rounds (75.53%), research presentations (72.57%) and admitting conferences (72.57%). In addition, comparative analyses showed that the proportion of respondents with VCF was significantly higher among those who attended admitting conferences (76.22%), case presentations or grand rounds (78.31%), and research presentations (77.78%). It can also be gleaned from the table that most participants attended VC for ≥5 times per week (40.51%) and each VC lasted for about 1 – 2 hours (80.59%).

Table 3 illustrates the prevalence of VCF among the respondents. The overall prevalence of VCF was 79.75% (95% CI = 74.11% to 84.42%). Among those with VCF, 35.86% had mild fatigue, 35.02% had moderate fatigue, and 8.86% had severe fatigue. In terms of the different constructs of VCF, results indicated that 85.23% had general fatigue, 68.78% had visual fatigue, 64.98% had social fatigue, 79.75% had motivational fatigue, and 67.09% had emotional fatigue.

The univariate binary logistic regression analyses of the different predictors of VCF among the respondents is presented in Table 4. Results indicated that age, marital status, work position, and attitude towards VC significantly predicted the odds of developing VCF among the respondents. In particular, results showed that age negatively affected the development of VCF (OR=0.92, p=0.001), wherein 1-year increase in age decreased the odds of VCF by 9%.

It can also be noted that marital status, specifically being married (OR=0.29, p=0.001), negatively affected the likelihood of having VCF. Those who are married were 3.45 times less likely to have VCF than those who were single. Interestingly, results showed that medical officers (OR=3.10, p=0.001) were 3.10 times more likely to have VCF than those who are non-medical officers. In contrast, medical specialists (OR=0.32, p=0.004) and nurses (OR=0.33) were 3.13 times and 3.03 times less likely to develop VCF, respectively, than their non-medical specialists and non-nurse counterparts. The negative attitude towards VC increased the likelihood of developing VCF (OR=4.13, p=0.023) by 4.13 times compared to those with a neutral attitude.

Table 5 depicts the univariate binary logistic regression analyses of the different predictors of the different constructs of VCF among the respondents. Results showed that age significantly predicted all constructs of VCF among the respondents. Specifically, results showed that for 1-year increase in the age of the respondents, the likelihood of developing general fatigue (OR=0.95, p=0.002) decreased by 5%. Similarly, the odds of developing visual (OR=0.96, p=0.008), social (OR=0.93, p=0.001), motivational (OR=0.93, p=0.001), and emotional fatigue (OR=0.93, p=0.001) decreased by 4%, 8%, 8%, and 8%, respectively, for every 1-year increase in the respondent's age. It can also be gleaned from the table that marital status predicted the likelihood of developing general, social, motivational, and emotional fatigue. Results indicated that married respondents were 2.33 times less likely to develop general fatigue (OR=0.43, p=0.029) than those who are single. In addition, those who were separated/widowed were 12.50 times less likely to have general fatigue (OR=0.08, p=0.006) than those who are single. Interestingly, results showed that the odds of social (OR=0.46, p=0.006), motivational (OR=0.26, p=0.001), and emotional fatigue (OR=0.46, p=0.007) were 2.17 times, 3.85 times, and 2.17 times lower, respectively, among married respondents than their single counterparts. In terms of work position, medical specialist (OR=0.35, p=0.002) were 2.86 times less likely to have motivational fatigue than non-medical specialist counterparts. On the other hand, medical officers were 2.56 times, 4.00 times, and 2.09 times more likely to develop general (OR=2.56, p=0.016), motivational (OR=4.00, p=0.001), and emotional fatigue (OR=2.09, p=0.009) respectively, than non-medical officers.

Results also showed that the frequency of VC significantly affected the development of general fatigue among the respondents. In particular, having 3 to 4 VCs per week (OR=3.06, p=0.031) increased the likelihood of general fatigue by 3.06 times than having 1 to 2 VCs per week. Similarly, the frequency of VC increased the chances of having general fatigue. Results showed those who attend VCs lasting for 1 – 2 hours (OR=17.46, p=0.015) and ≥3 hours (OR=28.50, p=0.008) were 17.46 times and 28.50 times more likely to have general fatigue than those who attend conferences which are less than 1 hour by duration. Finally, result showed that a positive attitude towards VC (OR=0.37, p=0.034) was 2.70 times less likely to have emotional fatigue than those who have a neutral attitude.

Table 1. ***Demographic Profile of the Respondents According to Videoconference Fatigue Status (N = 237)***

Characteristics	Videoconference Fatigue Status			Test Statistic[a]	*p*-value (Two-Tailed)
	Without Fatigue (n = 48)	With Fatigue (n = 189)	Total (N = 237)		
Age (Year; $\bar{x}$, SD)	42.02 (11.12)	35.06 (7.51)	36.47 (8.80)	5.15†	0.001
Age Category (*f*, %)				22.52†	0.001
21 to 39 Years Old	24 (50.00%)	151 (79.89%)	175 (73.84%)		
40 to 64 Years Old	22 (45.83%)	38 (20.11%)	60 (25.32%)		
≥65 Years Old	2 (4.17%)	0 (0.00%)	2 (0.84%)		
Sex (*f*, %)				0.01	0.911
Male	10 (20.83%)	38 (20.11%)	48 (20.25%)		
Female	38 (79.17%)	151 (78.89%)	189 (79.75%)		
Marital Status (*f*, %)				14.46†	0.001
Single	16 (33.33%)	120 (63.49%)	136 (57.38%)		
Married	30 (62.50%)	66 (34.92%)	96 (40.51%)		
Separated/Widowed	2 (4.17%)	3 (1.59%)	5 (2.11%)		
Work Position (*f*, %)				22.02†	0.003
Medical Specialist II	9 (18.75%)	28 (14.81%)	37 (15.61%)		
Medical Specialist III	5 (10.42%)	13 (6.88%)	18 (7.59%)		
Medical Specialist IV	5 (10.42%)	5 (2.65%)	10 (4.22%)		
Medical Officer III	6 (12.50%)	68 (35.98%)	74 (31.22%)		
Medical Officer IV	8 (16.67%)	38 (20.11%)	46 (19.41%)		
Nurse I	6 (12.50%)	8 (4.23%)	14 (5.91%)		
Nurse II	5 (10.42%)	20 (10.58%)	25 (10.55%)		
Nurse III	3 (6.25%)	9 (4.76%)	12 (5.06%)		
Nurse V	1 (2.08%)	0 (0.00%)	1 (0.42%)		
History of Previous COVID-19 Infection (*f*, %)	20 (41.67%)	78 (41.27%)	98 (41.35%)	0.01	0.960

[a]Comparative analyses were employed using Chi-Square Test of Homogeneity or Fisher's Exact Test for nominal data; Mann-Whitney U Test for ordinal or non-normally-distributed continuous data; and, independent *t*-test for normally-distributed continuous data.

*Significant at 0.05

†Significant at 0.01

Table 2. ***Videoconference Characteristics of the Respondents according to Videoconference Fatigue Status (N = 237)***

Characteristics	Videoconference Fatigue Status			Test Statistic[a]	*p*-value (Two-Tailed)
	Without Fatigue (n = 48)	With Fatigue (n = 189)	Total (N = 237)		
Videoconference Platform (*f*, %)					
Zoom	48 (100.00%)	189 (100.00%)	237 (100.00%)	0.00	1.000
Facebook Messenger	16 (33.33%)	37 (19.58%)	53 (22.36%)	4.17*	0.041
Skype	0 (0.00%)	2 (1.06%)	2 (0.84%)	0.51	1.000
Facetime	2 (4.17%)	6 (3.17%)	8 (3.38%)	0.12	0.665
Microsoft Team	15 (31.25%)	29 (15.34%)	44 (18.57%)	6.41*	0.021
Google Meet	24 (50.00%)	54 (28.72%)	78 (33.05%)	7.82†	0.005
Webex	1 (2.13%)	13 (6.88%)	14 (5.93%)	1.52	0.313
Slack	2 (4.17%)	11 (5.82%)	13 (5.49%)	0.20	1.000
Viber	4 (8.33%)	1 (0.53%)	5 (2.11%)	11.29	0.006
Veeva	0 (0.00%)	2 (1.06%)	2 (0.84%)	0.51	1.000
Delex	1 (2.08%)	0 (0.00%)	1 (0.42%)	3.95	0.203
Docquity	1 (2.08%)	2 (1.06%)	3 (1.27%)	0.32	0.494
Types of Videoconferences Attended (*f*, %)					
Admitting Conferences	27 (56.25%)	145 (76.72%)	172 (72.57%)	8.06†	0.005
Hospital Audits	37 (77.08%)	158 (83.60%)	195 (82.28%)	1.11	0.291
Lectures	46 (95.83%)	183 (96.82%)	229 (96.62%)	0.12	0.665
Case Presentations/Grand Rounds	31 (64.58%)	148 (78.31%)	179 (75.53%)	3.90*	0.048
Research Presentations	25 (52.08%)	147 (77.78%)	172 (72.57%)	12.70†	0.001
Committee Meetings	32 (66.67%)	115 (60.85%)	147 (62.03%)	0.55	0.458
Patient Interviews	0 (0.00%)	1 (0.53%)	1 (0.42%)	0.26	1.000
Mentoring	0 (0.00%)	2 (1.06%)	2 (0.84%)	0.51	1.000
Ward Orientation and Endorsements	1 (2.08%)	0 (0.00%)	1 (0.42%)	3.95	0.203
Frequency of Videoconference (*f*, %)				3.25	0.197
1 – 2 Times per Week	19 (39.58%)	50 (26.46%)	69 (29.11%)		
3 – 4 Times per Week	13 (27.08%)	59 (31.22%)	72 (30.38%)		
≥5 Times per Week	16 (33.33%)	80 (42.33%)	96 (40.51%)		
Duration of Videoconferences (*f*, %)				2.24	0.349
1 Hour	2 (4.17%)	2 (1.06%)	4 (1.69%)		

1 Hour to 2 Hours	38 (79.17%)	153 (80.95%)	191 (80.59%)		
≥3 Hours	8 (16.67%)	34 (17.99%)	42 (17.72%)		
Attitude towards Videoconference (*f*, %)				8.06*	0.012
Neutral Attitude	38 (79.17%)	132 (69.84%)	170 (71.73%)		
Negative Attitude	3 (6.25%)	43 (22.75%)	46 (19.41%)		
Positive Attitude	7 (14.58%)	14 (7.41%)	21 (8.86%)		

Table 3. ***Prevalence of Videoconference Fatigue among the Respondents (N = 237)***

Characteristics	Frequency (*f*)	Percentage (%)	95% Confidence Interval
Constructs of Videoconference Fatigue			
General Fatigue	202	85.23%	
Visual Fatigue	163	68.78%	
Social Fatigue	154	64.98%	
Motivational Fatigue	189	79.75%	
Emotional Fatigue	159	67.09%	
With Overall Videoconference Fatigue	189	79.75%	74.11% to 84.42%
Mild Fatigue	85	35.86%	29.97% to 42.22%
Moderate Fatigue	83	35.02%	29.17% to 41.36%
Severe Fatigue	21	8.86%	5.83% to 13.24%

Table 4. ***Univariate Binary Logistic Regression Analyses of the Different Predictors of Videoconference Fatigue among the Respondents (N = 237)***

Predictors	Videoconference Status (With Videoconference Fatigue)		
	Odds Ratio	SE	*p*-value (Two-Tailed)
Age (Years)	0.92†	0.02	0.001
Sex (Female)	1.05	0.42	0.911
Marital Status			
Single	Referent	–	–
Married	0.29†	0.10	0.001
Separated/Widowed	0.20	0.19	0.091
Work Position			
Medical Specialist	0.32*	0.13	0.004
Medical Officer	3.10†	1.08	0.001
Nurse	0.33*	0.14	0.007
History of Previous COVID-19 Infection	0.98	0.32	0.960

Frequency of Videoconference			
1 – 2 Times per Week	Referent	–	–
3 – 4 Times per Week	1.72	0.70	0.182
≥5 Times per Week	1.90	0.73	0.095
Duration of Videoconferences			
1 Hour	Referent	–	–
1 Hour to 2 Hours	4.03	4.09	0.171
≥3 Hours	4.25	4.57	0.178
Attitude towards Videoconference			
Neutral Attitude	Referent	–	–
Negative Attitude	4.13*	2.58	0.023
Positive Attitude	0.58	0.29	0.268

*Significant at 0.05
†Significant at 0.01

Table 5. ***Univariate Binary Logistic Regression Analyses of the Different Predictors of the Different Constructs of Videoconference Fatigue among the Respondents (N = 237)***

	General Fatigue		**Visual Fatigue**		**Social Fatigue**		**Motivational Fatigue**		**Emotional Fatigue**	
	OR	***p*-value (Two-Tailed)**	**OR**	***p*-value (Two-Tailed)**	**OR**	***p*-value (Two-Tailed)**	**OR**	***p*-value (Two-Tailed)**	**OR**	***p*-value (Two-Tailed)**
Age (Years)	0.95†	0.002	0.96†	0.008	0.93†	0.001	0.93†	0.001	0.93†	0.001
Sex (Female)	1.45	0.386	1.27	0.483	0.81	0.540	1.05	0.911	1.02	0.944
Marital Status										
Single	Referent	–	Referent	–	Referent	–	Referent	–	Referent	–
Married	0.43*	0.029	0.63	0.105	0.46†	0.006	0.26†	0.001	0.46†	0.007
Separated/Widowed	0.08†	0.006	0.24	0.126	0.25	0.136	0.19	0.078	0.52	0.483
Work Position										
Medical Specialist	0.51	0.074	0.70	0.246	0.57	0.058	0.35†	0.002	0.59	0.084
Medical Officer	2.56*	0.016	0.89	0.668	1.69	0.057	4.00†	0.001	2.09†	0.009
Nurse	0.66	0.307	1.92	0.079	0.92	0.795	0.61	0.178	0.66	0.196
History of Previous COVID-19 Infection	1.42	0.360	1.05	0.865	1.29	0.359	0.98	0.960	1.10	0.725
Frequency of Videoconference										
1 – 2 Times per Week	Referent	–	Referent	–	Referent	–	Referent	–	Referent	–
3 – 4 Times per Week	3.06*	0.031	0.99	0.988	1.21	0.588	1.15	0.736	1.47	0.285
≥5 Times per Week	1.63	0.236	0.92	0.800	1.35	0.365	1.40	0.387	1.27	0.473

Duration of Videoconferences										
1 Hour	Referent	–	Referent	–	Referent	–	Referent	–	Referent	–
1 Hour to 2 Hours	17.46*	0.015	203	0.484	5.82	0.131	3.90	0.181	2.24	0.426
≥3 Hours	28.50*	0.008	3.67	0.224	5.40	0.159	5.00	0.137	1.47	0.713
Attitude towards Videoconference										
Neutral Attitude	Referent	–	Referent	–	Referent	–	Referent	–	Referent	–
Negative Attitude	4.15	0.059	1.72	0.167	1.83	0.113	2.82	0.062	1.77	0.147
Positive Attitude	0.47	0.154	0.64	0.339	0.63	0.323	0.43	0.089	0.37*	0.034

*Significant at 0.05
†Significant at 0.01

CHAPTER V: DISCUSSION

Research findings have proven that VCF, a phenomenon first explored in late 2020, exists among physicians and nurses of a tertiary pediatric government hospital in Philippines, yielding a prevalence rate of 79.75%. The instituted lockdowns and work-from-home (WFH) protocols brought about by the COVID-19 pandemic may have markedly contributed to the rise in videoconferencing methods and its associated fatigue, as seen in the sharp increase of 350 million Zoom users by December 2020 from 10 million users pre-COVID era.[21] Using between-group comparisons approach and univariate binary logistic regression, several key findings were made evident:

Relationship of Age and Work Position with VCF

Research findings identified that VCF is more prevalent in the early-aged (21 to 39 years old) manifesting an overall VCF of 79.89 % as compared to middle-aged group generating only 20.11% (table 1). General, visual, social, motivational, and emotional fatigue decreased by 5%, 4%, 8%, 8%, and 8%, respectively, for every 1-year increase in the respondent's age (table 5). The proportion of respondents with overall VCF was also significantly higher among medical officers III (35.98%), followed by medical officers IV (20.11%) as seen in table 4. A univariate binary logistic regression analyses showed that MOs were 3.10 times more likely to have overall VCF than those who are non-MOs (table 4). MOs were 2.56 times, 4.00 times, and 2.09 times more likely to develop general, motivational, and emotional fatigue respectively, than non-medical officers (table 5). Notably, the medical officers III (MO III), also known as pediatric residents, and medical officers IV (MO IV) encompass bulk of the clinical, clerical and administrative responsibilities, consequently requiring their attendance on VCs more often in addition to regular FTF hospital duties. The study also demonstrated that more frequent use of VCs increased the likelihood of VCF. It can be inferred that VCF is more common among the younger age group for it correlates with their work positions (MO III) necessitating more VC exposure.

Relationship of Marital Status with VCF

Findings also showed that VCF was more prevalent in those who are single (63.49%, table 1), supporting a comprehensive review that categorized single people or older adults living alone

as part of the population more vulnerable to develop psychological distress in times of health crises.[22] The rationale stems from inadequate social support.

Relationship between VC Attitude and VCF

Aligned with previous literature [6], negative attitude towards VCs increased the likelihood of developing overall VCF by 4.13 times compared to those with a neutral attitude (table 4). Furthermore, positive attitude towards VCs was 2.70 times less likely to have emotional fatigue than those who have a neutral attitude.

General, Visual, Social, Motivational, and Emotional VCF on Nonverbal

Overload, Attention Restoration Theory, and Media Naturalness Theory

Respondents experienced general (85.23%), visual (68.78%), social 64.98%), motivational (79.75%) and emotional fatigue (67.09%) after engaging to VC (table 3). This underpins the Nonverbal Overload theoretical argument by Bailenson that stated there is exorbitant demands of eye gaze (visual), self-evaluation generated by camera mirror anxiety (general, social, and emotional), and cognitive overload (general and motivational) from virtual meetings in contrast to FTF interactions.[14] Fatigue may also be a result of energy depletion from the sustained attention demanded by VCs as proposed in ART.[11] Existence of these fatigue constructs could also be tied up to virtual meetings during Covid-19.[23] Our findings support the aforementioned theories as plausible explanations in developing the VCF phenomenon.

Limitations of the Study

While this research has contributed to the literature of VCF, there were some limitations. *Firstly*, the survey was conducted **online** creating (1) challenges in data gathering (ignored or deleted forwarded messages); (2) a potential biased sample, leading to an uneven distribution of sample size between doctors (78.1%) and nurses (21.9%); and (3) a possible intrasubject variation since the circumstance while answering the test was not supervised. *Secondly*, the survey tool asked only **closed ended questions** thus was limited by its inability to explore subtle dynamics related to respondent's behavior while engaging in VCs such as (1) if video camera was turned on or off; (2) if audio was unmuted or muted; (3) if respondent was attentive to VCs or simply had the tool as background sound; and (4) if respondent was multitasking while attending VCs. Some characteristics of respondents were not clarified as well such as those with (1) pre-existing psychological conditions, (2) single status but lives with family or friends or married status but lives alone, and (3) internet connectivity issues with speed and accessibility. *Thirdly,* participant **anonymity** was established making it difficult for the researcher to identify which ones need referrals. *Lastly,* this study was conducted only to doctors and nurses in **one government hospital** in the Philippines, rendering the findings as a weak representation of HCWs across the country.

CHAPTER VI: CONCLUSION AND RECOMMENDATIONS

Conclusion

Working people were forced to learn overnight the concept of VCs and instantaneously make these virtual platforms the main channel of communication. Research findings provided us

with new insights into the VCF and its relationship between age, work position, marital status, and negative attitude. The fields of meeting science and ART should be explored as these may guide organizations construct more structured virtual meetings and apply appropriate respite from work.[24, 25] Researchers should be driven to develop ways and coping strategies that will mitigate the burden and complications that may arise from this phenomenon.

Recommendations for further studies

Open-ended interviews and small group discussions should be conducted to a larger sample size to refine our understanding on the field. Future work can build on areas that this research was unable to address.

ACKNOWLEDGMENT

Accomplishing this daunting task was made possible by the professional guidance E.L. B Locson, J.M. Uy-Whang, N.A. Guiao, E.I. Bautista, M. Reandelar Jr., and J.R. Macindo. The author also expresses her profound gratitude to her parents, who have constantly provided substantial feedback and tireless proofreading throughout writing this piece. Lastly, the author thanks all the doctors and nurses of National Children's Hospital, Philippines, for participating in this research quest. This academic opportunity has been filled with so much growth and will not be taken for granted.

Appendix A
DATA COLLECTION TOOL
PART 1

Factors: This questionnaire is strictly for NCH personnel only.

Age/Sex:

Marital status:

Work position:
Medical Specialist IV, Medical Specialist III, Medical Specialist II
Medical officer IV, Medical officer III,
Nurse VII, Nurse VI, Nurse V, Nurse IV, Nurse III, Nurse II

Attending online meetings for more than 6 months: yes/no

What type of video platform do you use for online meetings? Check as many.
Zoom
Facebook Messenger
Skype
Slack
FaceTime
Microsoft Teams
Others

Types virtual meetins attended. Check as many.

1. Admitting conferences
2. Hospital audits,
3. Lectures
4. Case presentations/Grand Rounds Presentations
5. Research presentations
6. Committee meetings
7. Others

How often in a week do you participate in videoconferences?

A. 1 - 2 times per week
B. 3-4 times per week
C. 5 times and more per week

On a typical session, how long does a typical conference last?

A. Less than 1 hour
B. 1 hour to 2 hours
C. 3 hours and more

Previous history of covid infection: yes/no

Attitude measured on 5 point Likert-scale:
1 = not at all 2 neutral 3 = very much

How much do you enjoy/like participating in videoconferences? 1, 2, 3

Appendix B **DATA COLLECTION TOOL** **PART 2**					
Zoom Exhaustion Fatigue Questionnaire from Stanford University USA (February 2021)					
	Likert-scale: 1 = Not at all 2 = Slightly 3 = Moderately 4 = Very 5 = extremely				
	1	2	3	4	5
Thematic Constructs					
General fatigue	A. How tired do you feel after videoconferencing?				
	B. How exhausted do you feel after videoconferencing?				
	C. How mentally drained do you feel after videoconferencing?				
Visual fatigue	A. How blurred does your vision get after videoconferencing?				
	B. How irritated do your eyes feel hurt after videoconferencing?				
	C. How much do your eyes hurt after videoconferencing?				
Social Fatigue	A. How much do you tend to avoid social situations after videoconferencing?				
	B. How much do you want to be alone after videoconferencing?				
	C. How much do you need time by yourself after videoconferencing?				
Motivational Fatigue	A. How much do you dread having to do things after videoconferencing?				
	B. How often do you feel like doing nothing after videoconferencing?				
	C. How often do you feel too tired to do other things after videoconferencing?				
Emotional Fatigue	A. How emotionally drained do you feel after videoconferencing?				
	B. How irritable do you feel after videoconferencing?				
	C. How moody do you feel after videoconference?				
Reference: Zoom Exhaustion & Fatigue Scale. Fauville, Luo, Queiroz, et al. (Feb. 2021) *This questionnaire is strictly for NCH personnel only.*					

References

1. Google Trends, https://bit.ly/3oe8PW6

2. Manyu Jiang (2020). The Reason Zoom calls drain your energy - BBC Worklife. https://www.bbc.com/worklife/article/20200421-why-zoom-video-chats-are-so-exhausting

3. Sklar, Julia (April 24, 2020). Zoom fatigue' is taxing the brain. Here's why that happens. National Geographic. https://www.nationalgeographic.com/science/article/coronavirus-zoom-fatigue-is-taxing-the-brain-here-is-why-that-happens

4. Frone, M. R., & Tidwell, M. O. (2015). The meaning and measurement of work fatigue: Development and evaluation of the Three-Dimensional Work Fatigue Inventory (3D-WFI). Journal of occupational health psychology, 20(3), 273–288. https://doi.org/10.1037/a0038700

5. Bennett AA, Campion ED, Keeler KR, Keener SK. March 2021. Videoconference fatigue? Exploring changes in fatigue after videoconference meetings during COVID-19. J Appl Psychol;106(3):330-344. doi: 10.1037/apl0000906. PMID: 33871270

6. Fauville, Geraldine and Luo, Mufan and Queiroz, Anna C. M. and Bailenson, Jeremy N. and Hancock, Jeff,. February 15, 2021. Zoom Exhaustion & Fatigue Scale. SSRN: https://ssrn.com/abstract=3786329 or http://dx.doi.org/10.2139/ssrn.3786329

7. Sadock, B. J., Sadock, V. A., & Ruiz, P. (2015). Kaplan & Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry (Eleventh edition.). Philadelphia: Wolters Kluwer.

8. Bickley, L. S., Szilagyi, P. G., & Hoffman, R. M. (2017). Bates' guide to physical examination and history taking (Twelfth edition.). Philadelphia: Wolters Kluwer.

9. Centers for Disease Control and Prevention: https://www.cdc.gov/me-cfs/

10. Gartner 2020 Magic Quadrant for Meeting Solutions. https://searchunifiedcommunications.techtarget.com/feature/Gartner-videoconferencing-Magic-Quadrant-highlights-remote-work

11. Kaplan, S. 1995. The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology 15:169–82. doi:10.1016/0272-4944(95)90001-2

12. Ohly, H., White, M. P., Wheeler, B. W., Bethel, A., Ukoumunne, O. C., Nikolaou, V., & Garside, R. (2016). Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments. Journal of toxicology and environmental health. Part B, Critical reviews, 19(7), 305–343. https://doi.org/10.1080/10937404.2016.1196155

13. Quinn, R. W., Spreitzer, G. M., & Lam, C. F. (2012). Building a sustainable model of human energy in organizations: Exploring the critical role of resources. The Academy of Management Annals, 6(1), 337–396.

14. Bailenson, J. N. February 24, 2021. Nonverbal Overload: A Theoretical Argument for the Causes of Zoom Fatigue. Technology, Mind, and Behavior, 2(1). https://doi.org/10.1037/tmb0000030

15. Hall, E. T. (1969). The hidden dimension. Garden City, N.Y: Anchor Books.

16. Hall, E. T., Birdwhistell, R. L., Bock, B., Bohannan, P., Diebold, A. R., Durbin, M., Edmonson, M. S., Fischer, J. L., Hymes, D., Kimball, S. T., La Barre, W., Frank Lynch, S. J., McClellan, J. E., Marshall, D. S., Milner, G. B., Sarles, H. B., Trager, G. L., & Vayda, A. P. (1968). Proxemics [and Comments and Replies]. Current Anthropology, 9(2/3), 83–108.

17. Oppezzo, M.A., & Schwartz, D.L. (2014). Give your ideas some legs: the positive effect of walking on creative thinking. Journal of experimental psychology. Learning, memory, and cognition, 40 4, 1142-52 .

18. Goldin-Meadow, Susan. (2003). Hearing Gesture: How Our Hands Help Us Think. 10.2307/j.ctv1w9m9ds.

19. Smets, E. M., Garssen, B., Bonke, B., & De Haes, J. C. (1995). The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue. *Journal of psychosomatic research*, *39*(3), 315–325. https://doi.org/10.1016/0022-3999(94)00125-o

20. Daniel, W.W. and Cross, C.L. (2013) Biostatistics: a Foundation for Analysis in the Health Sciences. 10th Edition, John Wiley & Sons, Hoboken.

21. Iqbal, M. (2021). Zoom revenue and usage statistics. https:/www.businessofapps.com/data/zoom-statistics/

22. Perrin, P. C., McCabe, O. L., Everly, G. S., Jr, & Links, J. M. (2009). Preparing for an influenza pandemic: mental health considerations. Prehospital and disaster medicine, 24(3), 223–230. https://doi.org/10.1017/s1049023x00006853

23. Karl, K. A., Peluchette, J. V., & Aghakhani, N. (2021). Virtual Work Meetings During the COVID-19 Pandemic: The Good, Bad, and Ugly. Small Group Research. https://doi.org/10.1177/10464964211015286

24. Lynn Olien, J., Rogelberg, S. G., Lehmann-Willenbrock, N., & Allen, J. A. (2015). Exploring meeting science: Key questions and answers. In The Cambridge Handbook of Meeting Science (pp. 12-19). Cambridge University Press. https://doi.org/10.1017/CBO9781107589735.002

25. Ohly, H., White, M. P., Wheeler, B. W., Bethel, A., Ukoumunne, O. C., Nikolaou, V., & Garside, R. (2016). Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments. Journal of toxicology and environmental health. Part B, Critical reviews, 19(7), 305–343. https://doi.org/10.1080/10937404.2016.1196155

Contact email: alena.superficial.md@gmail.com