VR cue reactivity to ENDS cues - experiment protocol

**Research questions**

1. Do cues induce craving?
   1. Do physiological measures (i.e. skin conductance, pupil dilation, and heart rate variability) go up when people stare at cues (measured by eye tracking)?
   2. Is there a relationship between *number of cues* paid attention to in a scenario (measured through eye tracking) and increase in subjective craving (i.e. difference between subjective craving measures at the start and at the end of the scenario)?
   3. Is there a relationship between *time spent looking at cues* in a scenario (measured through eye tracking) and increase in subjective craving (i.e. difference between subjective craving measures at the start and at the end of the scenario)?
   4. Doe subjective craving go up over time spent in the VR scenario?
   5. Are any of the effects mentioned in 1.1-1.4 moderated by vaping and smoking experience of the participant?
2. Reliability/validity of the measures:
   1. Do physiological measures (i.e. skin conductance, pupil dilation, and heart rate variability) correlate with subjective craving?
   2. Does vaping dependence (PSECDI) correlate with physiological measures and subjective craving?
   3. Does cigarette dependence (PSCDI) correlate with physiological measures and subjective craving?

**Measures of interest**

*Eye tracking*. Specifically, times where a participant spent more than 2s looking at vaping paraphernalia. Measured through the Oculus, 4 times/second.

*Heart rate variability*. Measured through either the wristwatch or the chest band (to be decided). Measured 4 times per second(?).

*Subjective craving.* Measured on a 1-100 VAS scale at set points throughout the three VR environments

Control variables:

*Cigarette dependence.* Measured with the Penn State Cigarette Dependence index (PSCDI).

*Vaping dependence.* Measured with the Penn State Electronic Cigarette Dependence Index (PSECDI).

*Cybersickness.* Measured with the CyberSickness Questionnaire (CSQ).

*VR presence.* Measured with the igroup Presence Questionnaire (IPQ).

*Participant demographics*. Age, gender, ethnical background, smoking status, vaping status, (if applicable) vaping device used, experience with VR.

**User story (in short)**

*Situation* The researchers want to assess if vaping cues in a virtual environment elicit craving, and if this response is an indication of vaping dependency.

*Purpose* If cue responsiveness can be measured in VR and is indicative of dependency, that opens the door for using VR for interventions and tells us more about vaping behaviour (right now there isn’t even clarity if people get dependent/addicted)

*Expected outcome/benefit* The expected outcome is evidence that vaping behaviour correlates with physiological responses of stress as well as subjective cravings in response to vaping cues.

**Procedure (under Covid-19Alert Level 1)**

When signing up to the experiment, participants receive a digital copy of the information sheet and informed consent (see end of this protocol). Moreover, they are informed that if testing is conducted under Level 2, they will be asked to observe the level 2 safety requirements: i.e. to wear a facemask during the experiment (which can be provided by us) and to stay at home if they feel sick or have been in contact with a suspected or known Covid case.

One day before the booked experiment session, participants will be sent an email reminding them of the experiment session, the requirement that they should not smoke or vape from 1 hour prior to the experiment, as well as the Covid safety requirements.

On the day of the experiment, participants are welcomed to the lab. They are given the introduction speech:

Thank you for coming over today and participating in our research. The experiment that you are about to take part in aims to test if people who vape or smoke automatically start craving a vape when they see vaping-related cues in VR. We know that these kinds of responses exist in for example smokers when they see an ashtray, or people addicted to alcohol when they see a bottle opener. But it has not been extensively studied for vaping yet, and especially not using immersive technology as VR.

To ensure that everyone starts the experiment under similar conditions: could you please confirm that you have neither smoked nor vaped in the last hour? [*if the participant indicates that they have, the experiment will be stopped and rescheduled*].

The experiment consists of three parts: a pre-immersion survey, a VR session, and a post-immersion survey. During the VR session, you will wear a wristband [*shows Empatica E4 wristband*] which will measure skin conductance and heart rate. These are physiological measures that are related to craving. We will also use eye tracking, using the VR headset. And finally, you will be given the dot dial [*shows the Microsoft Surface dial*] which will allow you to answer the questions that pop up during the VR session. There will be a practice environment to get you used to the surroundings and answering questions; also, I’ll explain the session in more detail after you completed the survey. After the VR session, you will be asked to complete another survey and to complete a final 5-minute task.

There are two important things I need to mention before we start. Sometimes, being in VR makes people feel queasy. This is called cybersickness. Like carsickness, cybersickness doesn’t have lasting effects and should pass within a short while after people get out of VR. If at any point during this experiment you start feeling sick, please take off the headset immediately. In addition, regardless of whether you feel sick or not, you are at all times free to quit participating and demand your data to be removed from the dataset. However, since the data is logged anonymously, it will be hard for us to do so after you have left. Secondly, this experiment will expose you to vaping cues and may therefore make you crave a vape. While we have implemented a distraction task that will decrease these cravings before we let you go again, you may decide that you don’t want to participate at all. That is up to you.

Please read this information sheet and informed consent carefully and make sure you ask any questions you may have before signing.

Participants are presented with the information sheet (see end of the protocol) and informed consent (ditto). They are asked if they have any questions. After answering these, they are reminded that they can quit at any point and/or ask for their data to be removed without needing to provide a reason. If they agree, they will be asked to fill out the first part of the survey, which records the following:

Demographics, smoking and vaping status, smoking and vaping dependency (PSCDI and PSECDI; if applicable) and baseline cybersickness (CSQ).

The full survey is attached at the end of this protocol.

Then, participants will be led to the VR setup and given the following explanation.

We are about to start the VR session. First, we will need to finish calibration for eye tracking. When you put on the headset, you should see a VR environment with mountains in the background. I will press a button on this controller [*shows controller*] and ask if a menu has popped up. If that’s the case, I will hand over the controller to you and ask to start the calibration by aiming the controller at the third button from the left on the bottom of the menu [*shows a screenshot of the menu; see end of the protocol*] which is labeled “vive pro eye” and pull the trigger on the bottom of the controller [*shows trigger*]. You will be shown a menu with a button labeled CALIBRATE [*shows a screenshot of this menu; see end of the protocol*]. Select that button, and you should be taken through the calibration procedure automatically. When you are finished, please let us know. We will ask you to close all menu windows, by using the controller to click any spot that’s not a menu, until there are no windows left open. Then we will trade you the controller for the dot dial, and start the experiment.

The first scenario in the experiment will be a practice environment to get you used to VR and answering questions with the dot dial. You answer a question by turning the dial like this [*shows how*] and confirm your selected answer by pressing down [*shows how*]. After the practice environment, you will go through three experiment VR environments; all VR environments are separated from another by a 2-minute 360-degree nature scene to make sure you go into the next scene with a calm mindset. So, the order will be: practice – nature – scene 1 – nature – scene 2 – nature – scene 3. The VR environments have a conveyor belt principle, meaning that you will be taken through them automatically as if you’re on a conveyor belt.

Please remember that you can quit at any time, and please do take off the headset immediately if you start feeling sick.

Participants are given the VR headset and seated in the VR space. The experimenter starts up the controller and asks the participant if they can see the controller in VR. Upon a confirmation, the experimenter presses the menu button and asks the participant if a menu just popped up. If the participant confirms this too, the experimenter will hand over the controller to the participant and ask them to start calibration by pressing the third button on the left at the bottom of the menu.

Once calibration is complete, the experimenter will take the controller from the participant and hand them the dot dial, and inform them that they will be brought into the practice VR environment. This environment will last 2:32 (152s) and allows participants to get used to the VR headset and the dial that they can use to answer mock questions (`how do you feel’, `do you like the scenery’, `do you prefer the trees or the mountains’, `how do you feel’). These questions will be shown at 0:15, 0:55, 1:35 (95s), and 2:15 (135s) and stay up until answered for a maximum of 15s.

After the practice environment, participants are required to keep on their headset, and directly be immersed in a 360-degree video of a peaceful nature landscape. They will stay in this environment for 2 minutes.

Participants will then start on one of the three experimental VR environments. The order in which those are presented will be randomized. After the first two VR environments, participants will be given another session in the nature 360 video to allow them to go back to baseline.

The first VR environment is a stroll in the park. This video takes 4 minutes and 55 seconds (295s), contains 68 vaping cues (14 vapes, 44 ads, 8 vaping avatars, 1 smoking avatar, 1 cigarette), and asks about subjective craving at timepoints 0:00, 1:05 (65s), 2:10 (130s), 3:15 (195s), 4:20 (260s); this question will stay up until answered for a maximum of 15s.

The second VR environment is a visit to the vape shop. This video takes 4 minutes and 20 seconds (260s), contains 1155 (1017 bottles of e-liquid on display for sale, 99 vapes on display, 24 vapes shown elsewhere, 3 vapes in hand, 4 tv advertisements, 5 posters, 2 hookahs, 1 store sign) vaping cues, and asks for subjective cravings at timepoints 0:00, 0:55, 1:50 (110s), 2:45 (165s), 4:00 (240s). Moreover, at time points 30s, and 140s, the participant will be addressed by an avatar-employee of the store, who will offer them to help picking the next e-liquid flavor. At 3.50 (230s) a customer avatar will greet the participant and offer them a taste of their vape. This offer will then pop up as a question for the participant to answer (using a binary yes/no decision).

The third VR environment is at a bar. This video takes 4 minutes and 20 seconds (260s), contains 36 vaping cues (18 vapes exposed, 7 vapes in hand, 3 tv advertisements, 1 poster, 1 hookah, 6 vaping avatars), and asks for subjective cravings at timepoints 0:00, 0:55, 1:50 (110s), 3:45 (165s), 4:05 (245s); this question will stay up until answered for a maximum of 15s. Moreover, at time point 3:55 (235s) the participant will be offered a vape by two avatars.

After the third and final experimental VR environment, the participant will be led out of the VR space back to the desktop computer, where they can complete the post-experiment survey. This contains the IPQ and CSQ, as well as another measure of subjective craving. Participants are then instructed by the survey to engage in a distraction task (colouring in mandalas or solving sudoku puzzles, depending on their preference) for five minutes before they can return to the questionnaire for a final assessment of subjective craving and an open question asking for any suggestions the participant may want to leave on the experiment. They will be debriefed, given the chance to provide any verbal feedback or questions, thanked for their time, and reimbursed.

**Adjustments to procedure under Level 2**

Under level 2, the data collection will continue. Participants will be reminded in the email sent one day prior to their appointment that they will need to wear a face mask and stay at home when sick or if they’ve been in contact with a known or suspected Covid case. They will also be informed that the lab has masks available for them to use if need be.

Before arrival of a participant, all surfaces will be disinfected and wiped. Participants will be offered a face mask, asked to disinfect their hands (sanitizer provided by the lab), and to sign in through either the NZCOVID tracing app or on a physical tracking list, which will be kept separately from all other data that is collected during the experiment. Physical distancing of 1m will be observed throughout the experiment, except when the controller or dial has to be handed to the participant. Participants will be asked to wear a disposable ninja-mask underneath the headset (ninja masks provided by the lab). Participants refusing to comply will not be allowed to participate and be asked to leave. After the experiment, all surfaces will be disinfected once more.

**Adjustments to procedure under Level 3 and 4**

Under level 3 and 4, no data collection will take place. Participants who signed up for time slots under these levels will be contacted and asked to reschedule.

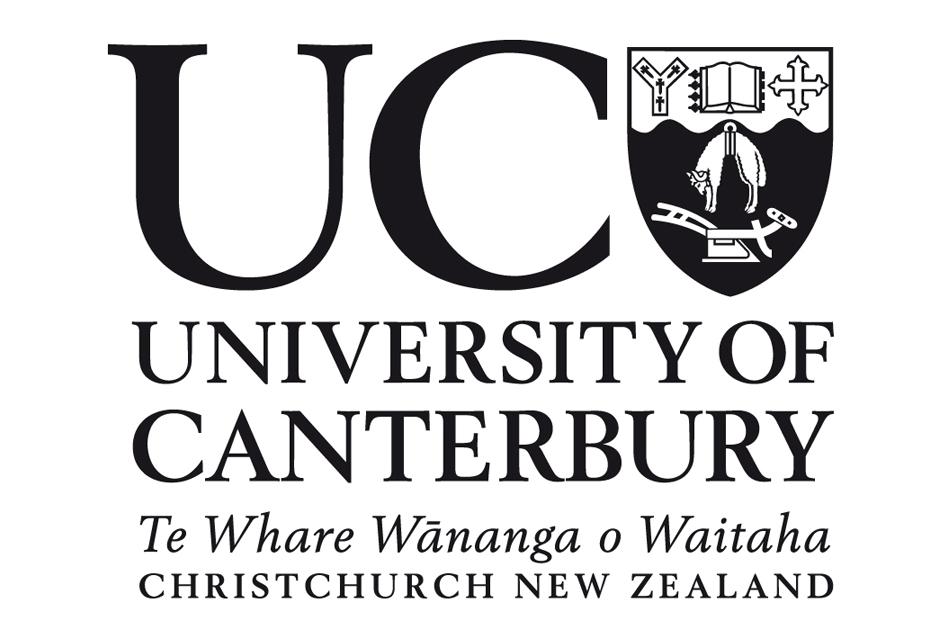
**Study design/data analysis plan**

Preliminary analyses will check for randomisation of gender, age, SES, experience in VR, cybersickness, and immersion in VR environments. If a significant difference between the groups shows on one of these variables, the models will be re-ran with the inclusion of that variable as covariate. Any differences in results between the original model and covariate model will be reported.

Furthermore, multilevel models will be ran to test the research questions 1 and 2. Specifically.

* 1. Three multilevel models with a physiological measure as DV and ‘looking at cue’ as a binary fixed effect; smoking status and vaping status as fixed effects; a random effect for participants and a random slope for VR scenario.
  2. A multilevel model with subjective craving as DV and ‘number of cues seen’ as a fixed effect; smoking status and vaping status as fixed effects; a random effect for participants and a random slope for VR scenario.
  3. A multilevel model with subjective craving as DV and ‘time spent looking at cues’ as a fixed effect; smoking status and vaping status as fixed effects; a random effect for participants and a random slope for VR scenario.
  4. Multilevel model with subjective craving at the end of a scenario as DV and craving at the start of the scenario as fixed effect; smoking status and vaping status as fixed effects; a random effect for participants and a random slope for VR scenario.
  5. Three multilevel models with a physiological measure as DV and subjective craving as fixed effect; smoking status and vaping status as fixed effects; a random effect for participants and a random slope for VR scenario.
  6. Four multilevel model with either of the physiological measures or subjective craving ad DV and the PSECDI as fixed effect; random effect for participants and random slope for VR scenario
  7. Four multilevel model with either of the physiological measures or subjective craving ad DV and the PSCDI as fixed effect; random effect for participants and random slope for VR scenario

A detailed data analysis plan is currently under construction to be logged prior to data collection at the OSF (open science framework) registry.

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**Virtual Environments to Study Preventive Health Attitudes – Vaping in Virtual Reality Experiment - Information Sheet**

Kia ora,

And thank you for showing interest in our experiment! This experiment uses virtual reality (VR) to study how people respond to vaping cues. Previous studies have used VR to show that smokers automatically start craving a cigarette when they see cues that are related to smoking (like ashtrays or packages). Because the use of electronic cigarettes or ‘vaping’ is relatively new, little is known yet about vaping as a habit or addiction. With this experiment, we want to learn more about where and when people vape.

If you choose to take part in this study, your will participate in a VR experiment which is run by researchers of the University of Canterbury. You do not need to have any experience with smoking or vaping to participate. However, it is important that you are 18 years or older, not currently under treatment for any mental illnesses, and are not pregnant. Important information about the experiment is given below.

**Location, duration and outline of the VR experiment***Location*.The VR experiment will take place in the vision space at the HIT Lab NZ. This is located at the second floor of the John Britten building on the University of Canterbury campus.

*Duration.* The entire experiment session, including introduction, an induction to VR, a number of questions, and debriefing, will take up to an hour.

*Outline.* On the day of the experiment:

* Please do not to smoke or vape one hour prior the experiment.
* When you arrive at the lab a researcher will be there to welcome you, give an overview of the experiment procedure, and answer any questions.
* The experiment will start with a few questions about your background information; e.g. gender, age, ethnicity, and smoking and vaping experience. This information will be used to compare if our group of participants was representative of the New Zealand population. For example, if only women over 60 from European origin do our test, our findings may not be very relevant to young adult Māori men.
* After the questions, the VR immersion session will start. This session consists of four VR environments. In between these environments you will watch a 360 degree videos of a nature scene.
  + The first VR environment is for you to practice how to use the VR head set and controllers. It will also function as a test to make sure that VR doesn’t give you cybersickness. If the latter is the case, you will not be allowed to carry on with the experiment.
  + After the VR practice has finished, you will be shown a 360 degree video of a nature scene. This is meant to give you a little break and get ready for the next VR environment.
  + Next, the experimental VR experience will start. You will be guided through three different VR scenarios, which will last about 4 minutes each. After each environment, you will watch the 360 degree nature video for two minutes before moving on to the next VR environment. The VR environments will have vaping cues, and you will be asked a couple of times how much you feel like vaping.
* After the VR immersion session, you will be asked to answer a few questions about the VR experience. Then you will be given a 5-minute distraction task, which will be your choice of puzzles or colouring pages. This is meant to bring down any cravings you may have gotten during the VR session. After the distraction task, you will be asked two more questions.
* Finally, the researcher will thank you for your participation and award you with $20 to reimburse travel costs and time.
* **NB** It will be possible to participate in the experiment under Covid Alert Level 2. All surfaces and equipment will be disinfected prior to your arrival. However, wearing a face mask will be mandatory. We will provide single use masks if you forget to bring your own. If you are feeling sick or if anyone you’ve been in contact with is being tested for Covid-19, please cancel or reschedule.

**Risks, confidentiality, and more information**

We do not expect that the study is harmful, but there are two possible risks that you should be aware of. First, there is a chance of you starting to feel queasy while you are in VR. This is called cybersickness, and it is similar to carsickness. It has no serious consequences and usually goes away when you get out of VR. However, we still ask you to be mindful of how you feel during the experiment. If you start feeling sick, please quit immediately.

Secondly, this experiment may make you craving a vape. We have added a distraction task to reduce this craving. If you are still uncomfortable with the idea, please think again if you want to sign up.

While fitting the VR headset, the experimenter may need to touch your head to assist. They will always ask for permission to do so. Also, eye tracking will be used, meaning that cameras in the headset will register what things you’re looking at.

As stated in the consent form, if you decide to take part in this experiment you have to agree to maintain complete confidentiality of all information shared, as well as information related to identities of other people involved. This means that we ask you to please not tell others about what happened during the experiment. This is because if they participate later on, they may respond in a different way because they know what they were going to see and what was going to be asked.

Participation in this experiment is voluntary. You can choose to stop at any point. You do not have to give a reason, and you will still be awarded 20$ if you quit. If you quit, we will remove all your information from our dataset.

If you want, you can find further support by reaching out to:

Te Hā - Waitaha Stop Smoking Canterbury, Telephone: 0800 425 700  
Email: [smokefree@cdhb.health.nz](mailto:smokefree@cdhb.health.nz)

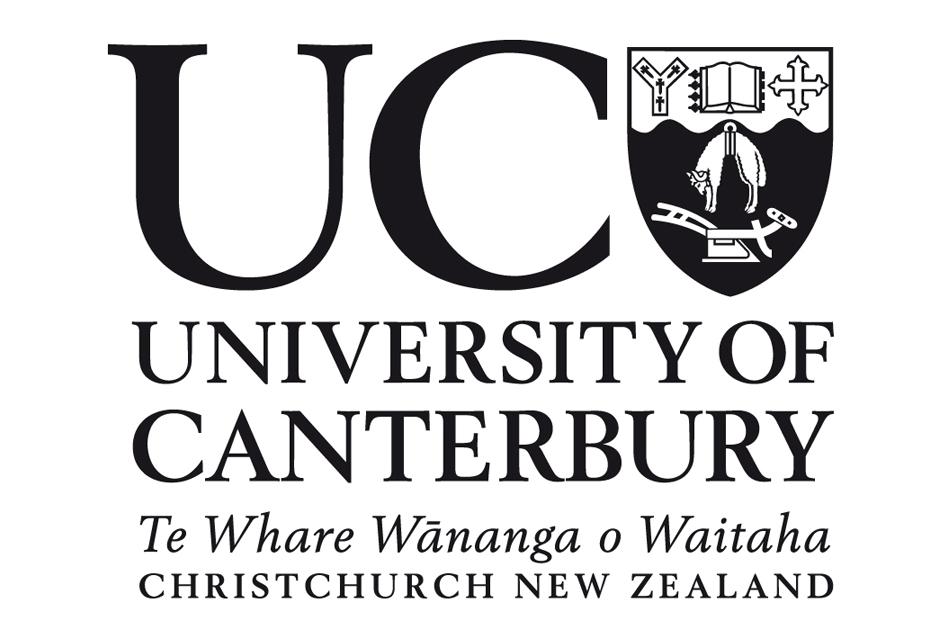
You can also find support on the following website:

**https://vapingfacts.health.nz/help-and-support.html**

The results of the project may be published in aggregated form, such as the mean and variation of responses. The complete (raw) dataset however will be completely confidential. This means that no-one outside of the research team will have access to the data. Moreover, the data is stored anonymously, meaning that there is no way to connect your name or address to any specific set of responses. The data will be password-protected, and saved on university owned devices. Only members of the research team will see and analyse the data.

Our research stems from a collaboration between different departments of the University of Canterbury: the School of Product Design, the Geospatial Research Institute, the GeoHealth Laboratory and the Human Interface Technology Laboratory NZ. The project is led by Simon Hoermann and Melanie Tomintz, who can be contacted at simon.hoermann@canterbury.ac.nz and melanie.tomintz@canterbury.ac.nz. They are happy to discuss any questions you may have about participation in the project.

If you agree to participate in the experiment, you will be asked to complete the consent form on the day that you come to the lab. The consent form is attached for you to read through, if you would like to.

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**Virtual Environments to Study Preventive Health Attitudes – Vaping in Virtual Reality Experiment - Consent Form**

□  I have been given a full explanation of this project and have had the opportunity to ask questions.

□  I understand what is required of me if I agree to take part in the research.

□  I confirm that I have not smoked or vaped for one hour before coming to this study.

□  I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.

□  I understand that any information or opinions I provide will be kept confidential to the project team members and that any published or reported results will not identify the participants.

□  I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after ten years.

□  I agree to maintain complete confidentiality regarding other people identities as well as information shared during the virtual environment experiment.

□  I understand the risks associated with taking part and how they will be managed.

□  I understand that I can contact the researchers, Simon Hoermann (simon.hoermann@canterbury.ac.nz) or Melanie Tomintz (melanie.tomintz@canterbury.ac.nz), for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch ([human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz)).

□ I understand that if I am to participate while Covid-19 Alert level 2 is in effect, I will be required to wear a face mask and observe social distancing rules. I will cancel or reschedule if I feel sick, or if any of my recent contacts is being tested for or has been diagnosed with Covid-19.

□  By signing below, I agree to participate in this research project.

Name: Signed: Date:

Please note: boxes indicate which sets of questions will be displayed together. Each box will be displayed on its own page.

Which gender do you identify as?

❏ Male

❏ Female

❏ Other

❏ Rather not say

What is your age in years?



❏ Rather not say

Which of the following ethnic groups do you belong to? (More than one option can apply)

❏Māori

❏ New Zealand European

❏ European

❏ Pacific peoples

❏ Asian

❏ MELAA (Middle Eastern/Latin American/African)

❏ Other, namely: 

❏ Don’t know

❏ Rather not say

What is the highest level of schooling that you have? (Either completed, or are currently enrolled at)

❏ No qualification

❏ Level 1 certificate

❏ Level 2 certificate

❏ Level 3 certificate

❏ Level 4 certificate

❏ Level 5 diploma

❏ Level 6 diploma

❏ Bachelor degree/level 7 qualification

❏ Graduate degree/honours degree

❏ Masters degree

❏ Doctorate degree

❏ Other (please state)

❏ Rather not say

*[question continues on the next page]*

Please enter your participant number: [*this will be filled out by the experimenter*]

❏ I have been given an explanation of this study and provided informed consent

*[demographics continued]*

What is your current employment status? Please tick all that apply

❏ Permanent employee

❏ Fixed-term employee

❏ Self-employed

❏ Casual employee

❏ Unemployed

❏ Student

❏ Other (please state)

❏ Rather not say

If a participant indicates they have used VR before:

Have you ever experienced cybersickness in your past use of VR?

❏ Never

❏ Rarely

❏ Sometimes

❏ Often

❏ Always

On a scale of 1 (not at all) to 100 (extremely much), how much do you feel like vaping at this moment?

1 100

What describes your smoking status best?

❏ Never smoked

❏ Currently smoking (daily)

❏ Currently smoking (occasionally)

❏ Used to smoke, but quit

If a participant indicated they have (ever) smoked:

How old were you (in years) when you smoked for the first time?



If a participant indicated they used to smoke, but quit:

How long did you smoke for?



If a participant indicated they are currently smoking:

How old were you (in years) when you vaped for the first time?



What is your primary reason for ***starting*** to vape? (You can pick more than one answer)

❏ To quit tobacco smoking

❏ To reduce tobacco smoking

❏ To save money (vaping is more economical than buying tobacco products)

❏ I am/was able to vape in places were tobacco is not allowed

❏ Out of curiosity/wanted to try them

❏ Vaping is healthier than conventional smoking

❏ People in my direct surroundings (friends, family, colleagues) were using them

❏ Other (please specify) 

❏ Don’t know

What is your primary reason for ***continuing*** to vape? (You can pick more than one answer)

❏ To quit tobacco smoking

❏ To avoid going back to smoking

❏ I enjoy vaping

❏ Vaping is less harmful than conventional smoking

❏ To avoid putting those around me at risk of secondhand smoke

❏ To save money (vaping is more economical than buying tobacco products)

❏ Vaping gives me a sense of belonging to a group

❏ Vaping helps me socialising

❏ Other (please specify) 

❏ Don’t know

What describes your vaping status best?

❏ Never vaped

❏ Currently vaping (daily)

❏ Currently vaping (occasionally)

❏ Used to vape, but quit

Do you want to quit smoking?

❏ Definitely yes

❏ Probably yes

❏ Might or might not

❏ Probably not

❏ Definitely not

If a participant indicated they used to vape, but quit:

How long did you vape for?



If a participant indicated they are currently vaping:

What kind of vaping device do you use? (e.g. tank, pen, mod, pod, JUUL, cig-a-like)



Do you use nicotine-containing e-liquid?

❏ Yes (please indicate the nicotine content you usually vape) 

❏ Sometimes (please indicate the nicotine content you usually vape, when you’re using nicotine e-liquid)



❏ No

❏ Don’t know

How many ml of e-liquid do you approximately use per week?

What kinds of e-liquid flavours do you use? (You can pick more than one answer)

❏ Tobacco

❏ Menthol

❏ Fruit

❏ Any flavour that’s sweet

❏ Other (please specify) 

Do you want to quit vaping?

❏ Definitely yes

❏ Probably yes

❏ Might or might not

❏ Probably not

❏ Definitely not

If a participant indicated that they are currently vaping: the Penn State Electronic Cigarette Dependence Index

How many times per day do you usually use your vaping device?

❏ 0-4 times a day

❏ 5-9 times a day

❏ 10-14 times a day

❏ 15-19 times a day

❏ 20-29 times a day

❏ 30+ times a day

On days that you can use your vaping device freely, how soon after you wake up do you first use your vaping device?

❏ Between 0 and 5 minutes

❏ Between 6 and 15 minutes

❏ Between 16 and 30 minutes

❏ Between 31 and 60 minutes

❏ Between 61 and 120 minutes

❏ Over 2 hours

Do you sometimes awaken at night to use your vaping device?

❏ Yes, 0-1 nights/week

❏ Yes, 2-3 nights/week

❏ Yes, 4+ nights/week

❏ No

Do you use your vaping device now because it’s really hard to quit (vaping)?

❏ Yes

❏ No

Do you ever have strong cravings to vape?

❏ Yes

❏ No

Over the last week, how strong have your urges to vape been?

❏ None

❏ Slight

❏ Moderate

❏ Strong

❏ Very strong

❏ Extremely strong

Is it hard to keep from using your vaping device in places where you are not supposed to vape?

❏ Yes

❏ No

*[Penn State Electronic Cigarette Dependence Index, continued]*

When you can’t vape for a while, or when you tried to stop using, did you feel more irritable because you couldn’t vape?

❏ Yes

❏ No

When you haven’t vaped for a while, or when you tried to stop using, did you feel nervous, restless, or anxious because you couldn’t vape?

❏ Yes

❏ No

If a participant indicated that they are currently smoking: the Penn State Cigarette Dependence Index

How many cigarettes per day do you usually smoke?

❏ 0-4 cigarettes

❏ 5-9 cigarettes

❏ 10-14 cigarettes

❏ 15-19 cigarettes

❏ 20-29 cigarettes

❏ 30+ cigarettes

On days that you can smoke freely, how soon after you wake up do you smoke your first cigarette?

❏ Between 0 and 5 minutes

❏ Between 6 and 15 minutes

❏ Between 16 and 30 minutes

❏ Between 31 and 60 minutes

❏ Between 61 and 120 minutes

❏ Over 2 hours

Do you sometimes awaken at night to have a cigarette?

❏ Yes, 0-1 nights/week

❏ Yes, 2-3 nights/week

❏ Yes, 4+ nights/week

❏ No

Do you smoke now because it’s really hard to quit?

❏ Yes

❏ No

Do you ever have strong cravings to smoke?

❏ Yes

❏ No

*[Penn State Cigarette Dependence Index, continued]*

Over the last week, how strong have your urges to smoke been?

❏ None

❏ Slight

❏ Moderate

❏ Strong

❏ Very strong

❏ Extremely strong

Is it hard to keep from smoking in places where you are not supposed to smoke?

❏ Yes

❏ No

When you can’t smoke for a while, or when you tried to stop smoking, did you feel more irritable because you couldn’t smoke?

❏ Yes

❏ No

When you haven’t smoked for a while, or when you tried to stop smoking, did you feel nervous, restless, or anxious because you couldn’t smoke?

❏ Yes

❏ No

Please mark the situations in which you feel a greater need to vape (more than one answer possible)

❏ When I see vape shops

❏ When I see people smoking/vaping

❏ When I see an advertisement for vaping

❏ When I see a vaping device

❏ When I smell tobacco

❏ When I smell fruit/sweet e-liquid

❏ When I sense another smell (please specify) 

❏ When I am at a social gathering

❏ When I am at a bar

❏ When I’m having drinks

❏ Other (please specify) 

I feel a higher urge to vape when I have stressful situations related to (more than one answer possible)

❏ Work

❏ Study

❏ Personal issues

❏ Feeling lonely

❏ Other (please specify) 

❏ Never

The CyberSickness Questionnaire (CSQ) (baseline measure)

Please indicate on a scale of 1 (not at all) to 7 (very much) how much you are experiencing each of the following points

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Not at all |  |  |  |  |  | Very much |
| Headache | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Eye strain | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Difficulty focusing | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nausea | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Fullness of the head | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Blurred vision | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dizziness (with eyes open) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dizziness (with eyes closed) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Vertigo  Vertigo | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

That was the first set of questions. Please contact the researcher to set you up for the VR immersive experience

The following questions will be about your experience in VR.

The CyberSickness Questionnaire (CSQ)

Please indicate on a scale of 1 (not at all) to 7 (very much) how much you are experiencing each of the following points

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Not at all |  |  |  |  |  | Very much |
| Headache | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Eye strain | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Difficulty focusing | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nausea | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Fullness of the head | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Blurred vision | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dizziness (with eyes open) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dizziness (with eyes closed) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Vertigo | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

The igroup Presence Questionnaire (IPQ)

Please indicate your agreement with the following statements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Strongly disagree | Somewhat disagree | Neutral | Somewhat agree | Strongly agree |
| In the computer-generated world I had a sense of “being there” | ❏ | ❏ | ❏ | ❏ | ❏ |
| Somehow I felt that the virtual world surrounded me | ❏ | ❏ | ❏ | ❏ | ❏ |
| I felt like I was just perceiving pictures | ❏ | ❏ | ❏ | ❏ | ❏ |
| I had a sense of acting in the virtual space, rather than operating something from outside | ❏ | ❏ | ❏ | ❏ | ❏ |
| I felt present in the virtual space | ❏ | ❏ | ❏ | ❏ | ❏ |
| I was not aware of my real environment | ❏ | ❏ | ❏ | ❏ | ❏ |
| I still paid attention to the real environment | ❏ | ❏ | ❏ | ❏ | ❏ |
| I was completely captivated by the virtual world | ❏ | ❏ | ❏ | ❏ | ❏ |
| The virtual world seemed more realistic than the real world | ❏ | ❏ | ❏ | ❏ | ❏ |

Please indicate what best described your VR experience on the following items:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Did not feel present |  |  |  | Felt present |
| I did not feel present in the virtual space | ❏ | ❏ | ❏ | ❏ | ❏ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Not aware at all |  |  |  | Extremely aware |
| How aware were you of the real world surrounding you while navigating in the virtual world? (i.e. sounds, room temperature, other people, etc.) | ❏ | ❏ | ❏ | ❏ | ❏ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Not real at all |  |  |  | Completely real |
| How real did the virtual world seem to you? | ❏ | ❏ | ❏ | ❏ | ❏ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Not consistent |  |  |  | Very consistent |
| How much did your experience in the virtual environment seem consistent with your real-world experience? | ❏ | ❏ | ❏ | ❏ | ❏ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | As real as an imagined world |  |  |  | Indistinguishable from the real world |
| How real did the virtual world seem to you? | ❏ | ❏ | ❏ | ❏ | ❏ |

On a scale of 1 (not at all) to 100 (extremely much), how much do you feel like vaping at this moment?

1 100

This is the start of the 5-minute break. Please feel free to fill out a sudoku or get started on a mandala. Which activity you choose (and how you compete it) is not part of the logged information. In five minutes, a button will appear on this screen that will allow you to finish the last two questions

On a scale of 1 (not at all) to 100 (extremely much), how much do you feel like vaping at this moment?

1 100

Have you got any further suggestions or remarks about the VR experience?

That was the final question. Thank you for participating!

The questionnaires used in this survey are:

* **The Penn State [Electronic] Cigarette Dependence Index (PSECD and PSCD)**

Foulds, J., Veldheer, S., Yingst, J., Hrabovsky, S., Wilson, S. J., Nichols, T. T., & Eissenberg, T. (2015). Development of a questionnaire for assessing dependence on electronic cigarettes among a large sample of ex-smoking E-cigarette users. *Nicotine & Tobacco Research*, *17*(2), 186-192. doi:10.1093/ntr/ntu204

* **The cybersickness questionnaire (CSQ)**

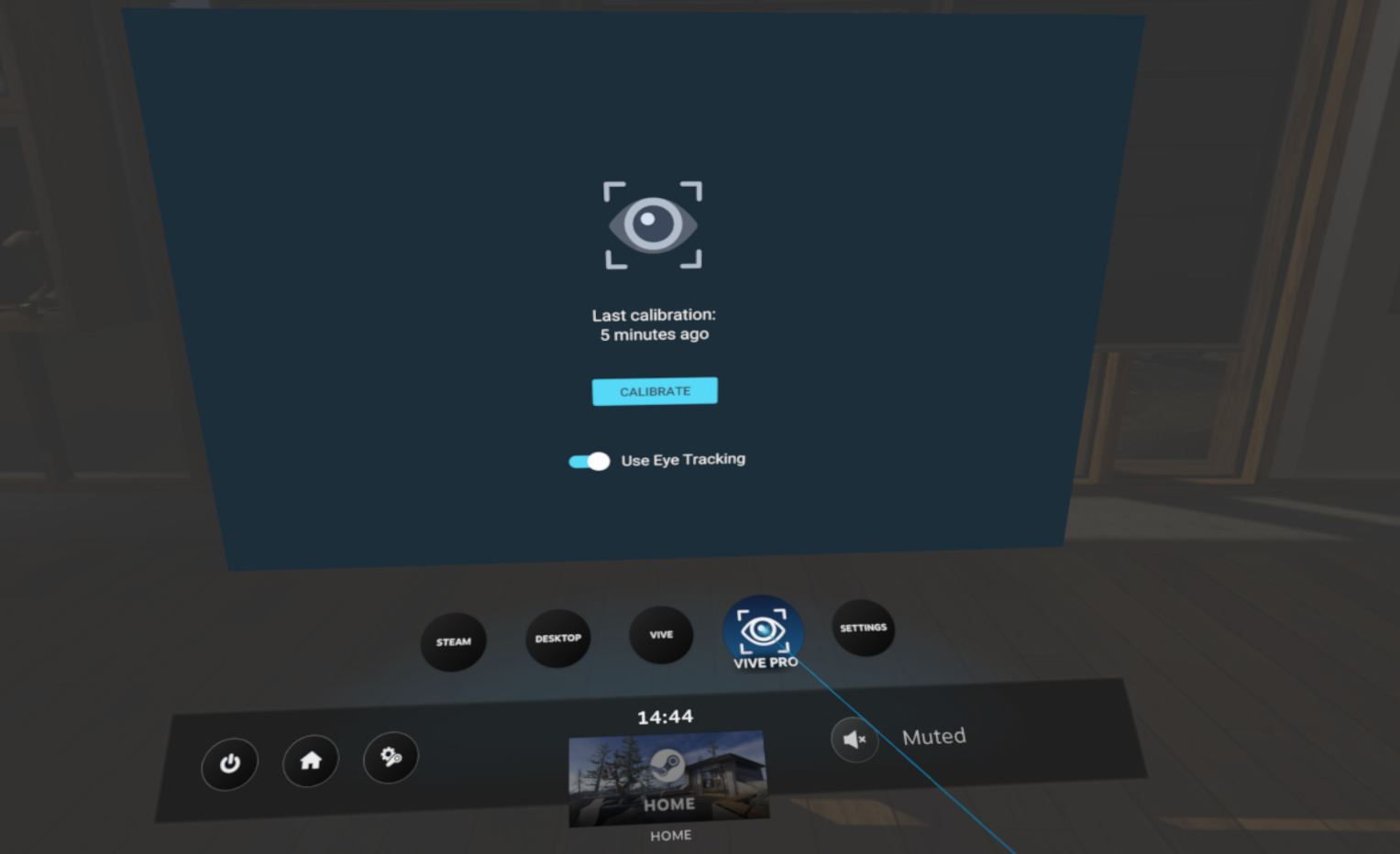
Stone Iii, W. B. (2017). Psychometric evaluation of the Simulator Sickness Questionnaire as a measure of cybersickness.

* **The iGroup Presence questionnaire (iPQ)**

Panahi-Shahri, M. (2009). Reliability and validity of Igroup Presence Questionnaire (IPQ). *International Journal of Behavioral Sciences*, *3*(1), 27-34.



Location of the Vive Pro Eye button that needs to be pressed to start calibration.



Calibration start up screen: participants will need to select the [CALIBRATE] button.