Exploring the Potential of Positive Attribute Framing to Reduce Observational Learning of Nocebo Side Effects

837

University of Sydney

Empirical Thesis submitted in partial fulfilment of the requirements for Honours in Psychology at the University of Sydney, 2020

Word Count: 11,989

Table of Contents

List of Figures

List of Tables

Abstract

Warnings about and observation of others' adverse experiences can trigger such outcomes via the nocebo effect. Emerging evidence suggests that positively framing side effect information to highlight the probability side effects *will not* occur reduces nocebo side effects relative to standard negative framing, which highlights the probability side effects *will* occur, but it is unclear whether this extends to observationally induced nocebo side effects. The current study used a model of virtual reality (VR) induced cybersickness to investigate this. Before viewing a VR video, 202 healthy volunteers were randomly assigned to receive a positively framed ("7 out of 10 people *will* not experience cybersickness"), negatively framed ("3 out of 10 people *will* experience cybersickness"), or no side effect warning, and to either witness a confederate model cybersickness symptoms (observational learning [OL]), or to not witness such modelling (no OL). Framing and OL did not affect composite VR-induced cybersickness scores. However, OL elevated VR-induced nausea specifically, and anxiety and expectancy, though no framing effects were found on these outcomes. Expectancy and anxiety predicted VR-induced cybersickness and nausea with mediation analysis indicating that expectancy completely mediated the effect of OL on VR-induced nausea – suggesting causal influence – but that anxiety did not. The current findings uniquely demonstrate OL-induced nocebo side effects in an online environment and indicate that media platforms should consider the unnecessary harm that can arise – via the nocebo effect – from simply observing other's negative experiences. The current study provided no evidence that positive framing can attenuate OL-induced nocebo side effects. Future studies should therefore explore alternative methods to reduce OL of nocebo side effects; these should specifically target expectancy given the current evidence that it mediates the effect of OL on nausea.

Keywords: nocebo effects, attribute framing, observational learning, expectancy, anxiety

Exploring the Potential of Positive Attribute Framing to Reduce Observational Learning of Nocebo Side Effects

Being warned of adverse effects can trigger such adverse outcomes. This is exemplified within healthcare settings where professionals are ethically obliged to practice informed consent and warn patients about potential adverse effects of their treatment. Here, the communication of side effect risk paradoxically increases side effect occurrence via the nocebo effect (Barnes, Faasse, et al., 2019; Myers et al., 1987), which occurs when various forms of negative information trigger adverse outcomes.

The burden of nocebo effects is immense and permeates multiple experiences including pain, nausea, medication side effects, itch, sleep, and irritable bowel syndrome (for reviews see Wolters et al. 2019; Webster et al., 2016). Concerningly, nocebo effects occur alongside inert and active treatments. For example, the efficacy of a new treatment can be undermined simply by sharing contextual elements with a previous unsuccessful treatment (Kessner et al., 2013; Zunhammer et al., 2017). These characteristics of nocebo effects force individuals to explore multiple treatment options and ultimately increase overall treatment duration, which comes at a high cost to individuals and society (Barsky et al., 2002). Additionally, nocebo effects can overshadow the benefits of active treatments, leading to the cessation and failure of treatment regimens. Adherence to and efficacy of statin drugs for treating high blood cholesterol is an excellent example. Between 10 and 25% of patients commonly report muscle pain as a side effect of taking statins (Ganga et al., 2014). However, when compared to an inert placebo under double-blind conditions, statins produce equivalent muscle pain to placebo (Gupta et al., 2017), suggesting nocebo effects are largely responsible for the reported side effects. Importantly, however, these nocebo-induced muscle pains often lead patients to cease their medication, subsequently increasing their risk of serious life-threatening health complications (Collins et al., 2016). This problem is, unfortunately, not

limited to statins. Analysis of nocebo side effects in randomised control trials suggests that anywhere between 40-100% of medication side effects are attributable to nocebo effects, rather than the active drug (Mahr et al., 2017). Clearly, nocebo effects create immense burden across multiple contexts.

Within the informed consent process, adjusting how side effects are communicated can balance treatment goals and ethical requirements. Preliminary evidence suggests that positive framing of side effect warnings to highlight the likelihood of *not* experiencing side effects (i.e 7 out of 10 people will *not* experience side effects), may reduce nocebo side effects (Faasse, Helfer, et al., 2019; Mao et al., in press; O'Connor et al., 1996). However, warnings are not the only source of negative information that leads to nocebo side effects. Although much less studied, evidence indicates that nocebo effects can also be developed by observational learning, where simply observing another's adverse reaction can induce a similar response in the observer (Colloca & Benedetti, 2009). Observational learning can occur through various mediums including direct in-person interactions, television and print media coverage, and social media (Faasse, 2019). Considering this sheer abundance of opportunities for adverse effects to be triggered socially, the observational learning of nocebo effects remains concerningly understudied. Critically, methods of inhibiting the observational learning of nocebo effects are yet to be investigated. To address this, the current study investigated whether the beneficial effects of positive attribute framing extend to observationally induced nocebo side effects. The study also sought to shed light on the mechanisms underlying nocebo effects to facilitate specific targeting of mechanisms and mitigation of these adverse effects.

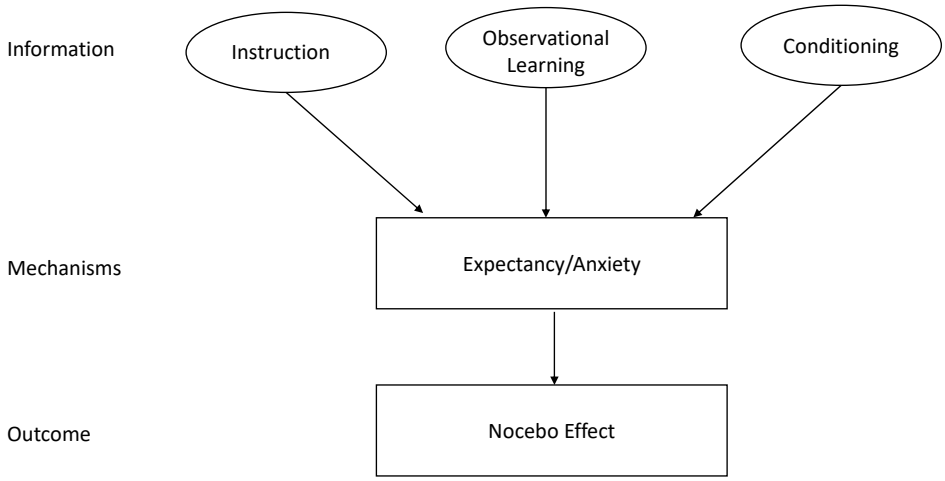
The Nocebo Effect

The nocebo effect is a powerful psychological phenomenon that occurs when purportedly inert elements of a context, such as a warning or observation of another person's

behaviour, elicit negative experiences. Nocebo effects encompass primary nocebo effects: adverse outcomes as focal treatment effects (i.e. this injection causes nausea), and nocebo side effects: adverse outcomes ancillary to primarily beneficial treatments (i.e. this medication decreases pain though may cause nausea) (Faasse et al., 2019). Regardless, nocebo effects are *not* attributable to the active component of a treatment. Instead, as shown in Figure 1, they are triggered by various information sources including instructions, and learning phenomena such as classical conditioning and observational learning (Webster et al., 2016), that are mediated by psychological processes, such as expectancy and anxiety. Therefore, information forms are triggers of nocebo effects, rather than underlying mechanisms.

Figure 1

Information Sources and Mechanisms Underlying Nocebo Effects



Nocebo Effect Information Sources

Instruction. The majority of nocebo effect research has focused on instruction, where providing negative information has repeatedly been shown to induce nocebo effects (Colagiuri et al., 2012; Mondaini et al., 2007; Myers & Calvert, 1984; Neukirch & Colagiuri, 2015; Van Laarhoven et al., 2011). The ability of instruction to induce nocebo effects was

demonstrated by Van Laarhoven et al. (2011) who gave participants verbal warnings about the side effects of mild electrical stimulation. Participants in nocebo conditions were informed that either 95% of people experience pain and 5% experience itching, or 95% of people experience itching and 5% experience pain. Participants in the control condition were told that 5% experience pain and 5% experience itching. Importantly, the same electrical stimulation was used for participants regardless of the warning received. After receiving the electrical stimulation, participants in the nocebo conditions reported significantly greater occurrence of the symptom described with the 95%, compared to control participants.

Observational Learning. Individuals can also learn behaviours by observing specific patterns of behaviour demonstrated by other individuals (Bandura, 1977). Observing another person's behaviour in response to a stimulus, and whether that behaviour has positive or negative consequences, can influence how the observer will respond in a similar situation. This process, known as observational learning, is a fundamental tenant of social learning theory (Bandura, 1977).

Observational learning can occur via various sources of information. One information source is behavioural modelling, constituting direct observation of another individual's behaviour. This is distinguished from observational learning via other information sources such as symbolic modelling: being exposed to representations of another's experience, or verbal modelling: receiving verbal description of another's behaviour (Bajcar & Bąbel, 2018). Observational learning is a fundamental and ubiquitous way that humans learn from one another and improve their behavioural repertoire.

Although less studied, nocebo effects can also be induced via observational learning. Several studies in pain have shown observational learning can trigger nocebo effects (Colloca & Benedetti, 2009; Koban & Wager, 2016; Świder & Bąbel, 2013; Vögtle et al., 2013; Vögtle et al., 2016; Vögtle et al., 2019). Colloca and Benedetti (2009) first demonstrated this

phenomenon. Participants in this study either observed a model give greater pain ratings to shocks preceded by red lights than shocks preceded by green lights or were exposed to no such modelling. When subsequently tested with a series of shocks, unknowingly of the same intensity, participants who witnessed the modelling gave higher pain ratings to shocks preceded by red lights than participants who witnessed no modelling, demonstrating a nocebo effect within the observation group.

Faasse et al. (2015) and Faasse et al. (2018) are the only studies, to date, to investigate observational learning of nocebo side effects. In Faasse et al. (2015), eighty-two participants were administered a placebo medication, under the guise of a beta-blocker. The medication was described as having a calming effect, but participants were also warned of possible side effects. After taking the medication, participants sat in a waiting room where a confederate was asked by the experimenter about their condition following treatment administration. The confederate either reported experiencing side effects or reported experiencing no side effects. Participants who witnessed the confederate model side effects had increased self-report and physiological measures of the modelled side effects compared to those who witnessed the confederate model no side effects, demonstrating observational learning of nocebo side effects. The same pattern of results was also found by Faasse et al. (2018) who employed a similar method. Hence, there is clear evidence that nocebo side effects can be induced by observational learning, however, this is not a favourable phenomenon. Furthermore, methods of inhibiting this learning are yet to be discovered.

Classical Conditioning. Though not the focus of this thesis, classical conditioning is also implicated in nocebo effects. Conditioning procedures to induce nocebo effects typically involve contingently pairing a neutral cue with an aversive stimulus that elicits an unpleasant response. Over several trials, the neutral cue becomes associated with the aversive stimulus, and comes to trigger the unpleasant response. Nocebo effects can be induced via conditioning

procedures alone (Bąbel et al., 2017; Colloca et al., 2010; De Peuter et al., 2007; Klosterhalfen et al., 2009) or through a combination of conditioning and verbal instruction (Bartels et al., 2014; Quinn et al., 2015). For example, Quinn et al. (2015) conducted a conditioning and instruction study, using galvanic vestibular stimulation (GVS) as a model of nocebo nausea. Pertaining to instruction, all participants were warned about nausea as a side effect of GVS. The two experimental groups underwent two conditioning trials of GVS calibrated to induce nausea, whereas the control group received two trials of placebo - non-nauseating - stimulation. At test, all groups received placebo stimulation. Participants who experienced nauseating GVS during training reported significantly greater nausea symptoms than those in the control group, exemplifying the induction of nocebo nausea via the combination of conditioning and instruction paradigms.

Mechanisms of the Nocebo Effect

Expectancy and anxiety are proposed psychological processes by which nocebo effects arise. Common to several different models of how nocebo effects arise is the notion that instruction, observational learning, and conditioning lead to the generation of expectancies and anxiety (Blasini et al., 2017; Colloca & Miller, 2011; Faasse, 2019).

Expectancy. Convincing evidence from multiple studies across a variety of nocebo symptoms (including nausea, pain, headache and caffeine withdrawal) supports expectancy as a robust predictor and therefore central mechanism of nocebo effects (Benedetti et al., 2006; Colagiuri et al., 2015; Colagiuri & Zachariae, 2010; Fillmore & Vogel-Sprott, 1992; Klosterhalfen et al., 2009; Köteles & Babulka, 2014; Link et al., 2006; Mills et al., 2018; Vase et al., 2013; Woo, 2015). For example, meta-analytic evidence from Colagiuri and Zachariae (2010) elucidated that chemotherapy patients' expectancy of experiencing nausea before their initial treatment significantly predicts the intensity and occurrence of nausea

post-chemotherapy. Similarly, Corsi and Colloca (2017) found that expectancies of pain before administration of a heat stimulus correlated positively with participant's pain ratings.

Among several explanations of how expectancies can elicit physiological outcomes, like nocebo effects, is Kirsch's response expectancy theory (Kirsch, 1985, 2018). This theory fundamentally asserts that a person's expectation of performing a certain non-volitional response to an event or stimulus (a response expectancy) is enough to generate, or exacerbate, that response. Response expectancies are argued to have separate underlying physiological substrates, which render them capable of eliciting specific physiological responses (Kirsch, 2001). For example, the expectation of pain is argued to have an underlying physiological substrate which results in the experience of pain, distinct from the expectation of nausea with its own underlying substrate which results in the experience nausea. Response expectancies are proposed to be self-perpetuating and, consequently, resistant to extinction, such that one's expectancy of experiencing harm then results in that experience, which reinforces the expectancy (Kirsch, 2018). Response expectancy theory is also corroborated by neurobiological evidence. Brain imaging fMRI studies have found that the expectancy of pain preceding a painful stimulus increases activity in cortical regions involved in pain processing, namely the somatosensory and anterior cingulate cortices (Schmid et al., 2015).

Anxiety. Although commonly proposed as the second psychological mechanism of nocebo effects, there is inconsistent evidence of the involvement of anxiety in nocebo responses beyond hyperalgesia (Clarke, 2019; Mao et al., in press). Some studies in pain implicate the involvement of anxiety in nocebo effects (Colagiuri & Quinn, 2018; Danker-Hopfe et al., 2010; Nevelsteen et al., 2007; Woo, 2015). For example, Colagiuri and Quinn (2018) investigated anxiety as indexed by self-report and galvanic skin response (a physiological marker of autonomic arousal), among placebo, nocebo, and no treatment pain

conditions. When compared to placebo and no treatment conditions, levels of self-report and autonomic anxiety were heightened preceding nocebo treatment pain trials. There is also emerging evidence from other conditions such as wind turbine syndrome. Crichton et al. (2014) found that television current affairs footage highlighting the negative health effects of exposure to wind turbine sound increased participants' anxiety, and the subsequent occurrence of nocebo effects.

Neurochemical pathways involved with anxiety responses are also implicated in nocebo effects. Benedetti et al. (2006) found that instructionally induced nocebo effects were associated with hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis, a central biological system for stress and anxiety responses. HPA axis activation and nocebo hyperalgesic responses were blocked by pharmacological anxiety antagonists, though such antagonists failed to produce the same effect in the absence of nocebo instruction. This evidence explicates the involvement of anxiety in producing nocebo hyperalgesia induced via instruction.

Despite this evidence, other studies have failed to observe anxiety effects. In investigations of nocebo hyperalgesia, Vögtle et al. (2013), Vögtle et al. (2016), and Vögtle et al. (2019) found no differences in anxiety between nocebo and control conditions, and critically, no relationship between anxiety and nocebo responding. Mao et al. (in press) also failed to find differences in anxiety between treatment and no treatment groups within a model of VR-induced nocebo nausea. Further research is therefore required to clarify the mechanistic role of anxiety in nocebo effects.

Attribute Framing and Nocebo Side Effects

Side effect warnings are known to trigger side effects. Yet, framing this warning to highlight the likelihood of *not* experiencing side effects (positive framing) seems to be an ethical way to circumvent this issue. Research into side effect mitigation by attribute framing,

to date, has focused exclusively on warning (instruction) induced nocebo side effects. Critically, this research has ignored side effects induced by other information sources. Hence, whether the benefit of positive attribute framing extends to inhibiting side effects induced by observational learning is currently unknown.

Attribute Framing Effects

Kahneman and Tversky's prospect theory (1979) asserts that subtle changes in information presentation can lead humans to make choices that violate the assumptions of objective reality. This notion is exemplified through decision-making research which revealed that individuals shift their preference of outcomes depending on whether information is positively framed, such as lives saved, in comparison to negatively framed, such as lives lost (Tversky & Kahneman, 1981). These preference shifts occur despite the information being statistically equivalent, explicating the human tendency to weight gains and losses unequally.

Although less studied, subtle changes in the way that side effect information is framed also appear capable of influencing side effect experience. One example of this is attribute framing, a type side effect framing (Levin et al., 1998) whereby statistically equivalent information is presented highlighting either the likelihood of *not* experiencing a side effect (positive framing) or the likelihood *of* experiencing a side effect (negative framing).

Existing Studies of Attribute Framing and Nocebo Side Effects

The limited available studies on attribute framing effects upon nocebo side effects have yielded inconsistent findings. Some evidence suggests that positive attribute framing can inhibit instructionally-induced nocebo side effects (Faasse et al., 2018; Mao et al., in press, O'Connor et al., 1996). O'Connor et al. (1996) first found this effect. In their study, participants were administered influenza vaccinations accompanied by side effect warnings with manipulated framing. Patients were warned either in the positive frame e.g "40 out of

100 people who receive the vaccine will get a sore arm" or the negative frame e.g. "60 out of 100 people who receive the vaccine remain free of side effects, such as a sore arm". Three days following vaccination, the positive framing recipients reported fewer side effects than the negative framing recipients.

While positive framing can inhibit nocebo side effects, the provision of any warning still increases side effect occurrence. Mao et al. (in press) used virtual reality (VR) to investigate nocebo cybersickness. Participants received either a positively framed warning "7 out of 10 people will not experience nausea", a negatively framed warning "3 out of 10 people will experience nausea", a general warning "a proportion of people will experience nausea", or no warning if control. A nocebo effect emerged as the provision of any warning increased cybersickness symptoms compared to no warning. The benefit of positive framing was also demonstrated by reducing cybersickness compared to negatively framed and general warnings.

Other studies, however, do not reveal framing effects (Caplandies et al., 2017; Devlin et al., 2019; Webster et al., 2018). For example, Caplandies et al. (2017) used sham transcranial direct current stimulation to investigate nocebo headaches. Participants were warned that headache occurrence was either 30% likely to not occur - positive frame - or 70% likely to occur - negative frame. Nocebo symptoms were greater in the warning conditions compared to no warning, however critically, no framing effect emerged. Webster et al. (2018) also failed to find a framing effect using positively and negatively framed participant information leaflets, however conclusions of an attribute framing effect are confounded by the fact the framing warnings differed in their inclusion of statistical information (natural frequencies or percentage) and verbal descriptors of likelihood, which are factors postulated to modulate framing effects (Barnes, Faasse, et al., 2019). One potential reason for such inconsistent findings is that, as it appears, positive framing is

capable of reducing instructed nocebo side effects only when the absolute risk of side effect occurrence is low (i.e 3 out of 10), not when absolute risk is high (i.e. 7 out of 10).

While there is encouraging preliminary data suggesting positive attribute framing can inhibit nocebo side effects, these findings remain limited to nocebo side effects induced by warnings. For example, no study has tested whether the framing effects extend to observationally induced nocebo side effects.

The Current Study

The limited literature available indicates that nocebo side effects can be induced by observational learning, and that positively framed warnings can reduce nocebo side effects induced by instruction, at least under some circumstances. What remains unknown, however, is whether positive framing can inhibit nocebo side effects induced via observational learning. This is of great clinical relevance since treatments often occur in the presence of others, who are then inadvertently subjected to observational learning (Benedetti, 2013), in addition to observational learning through the media whereby medication users have been found to report greater side effects after watching interviews in which personal stories of medication side effects are communicated (Faasse et al., 2009; Faasse et al., 2012). Positive framing of side effect warnings has great potential as an inexpensive and easily disseminated method of reducing observational learning of nocebo effects. The current study, therefore, investigated the effects of attribute framing and observational learning on nocebo side effects, using a model of VR-induced cybersickness. Whether attribute framing and observational learning interact in their influence on nocebo cybersickness was a key research question. Specifically, whether the benefits of positive framing extend to attenuate observational learning of nocebo side effects.

VR was chosen as a model of cybersickness in light of previous research demonstrating the capability of VR technologies to elicit cybersickness symptoms (Barnes et

al., 2019; Mao et al., in press). VR technology is prevalent, with effective applications in medical training (Samadbeik et al., 2018), stroke rehabilitation (Laver et al., 2017), psychological therapy (Valmaggia et al., 2016), and education (Radianti et al., 2020). Concerningly though, 25-60% of users report cybersickness symptoms when using VR, which can lead to cessation of use (Munafo et al., 2017; Rebenitsch & Owen, 2016). Previous studies have shown that cybersickness is not always attributable to VR itself but can arise via the nocebo effect. Such experience is susceptible to framing manipulations (Mao et al., in press), however, whether observational learning contributes to cybersickness remains unknown. Furthermore, elucidation of the psychological mechanisms underlying nocebo effects is also imperative to improve understanding and aid mitigation of these effects which inhibit the widespread implementation of VR technology.

As a secondary aim, the current study sought to shed light on expectancy and anxiety as mechanisms of nocebo side effects. The few framing studies that have assessed anxiety (Clarke, 2019; Mao et al., in press; Webster et al, 2018) and expectancy (Clarke, 2019; Devlin et al., 2019; Faasse, et al., 2018; Mao et al., in press; Webster & Rubin, 2020) provide mixed evidence. There is also inconsistent evidence of expectancy (Koban & Wager, 2016; Vögtle et al., 2019) and anxiety (Vögtle et al., 2013; Vögtle et al., 2019) as mechanisms underlying observational learning of nocebo side effects. Hence, it is important that anxiety and expectancy are assessed to elucidate any role they may play in affecting and/or predicting nocebo side effects, and the effects of framing and observational learning on nocebo side effects.

Based on existing literature, observing the confederate model cybersickness symptoms (observational learning) was hypothesised to increase nocebo cybersickness relative to instruction alone (no observational learning). Regarding framing, it was hypothesised that receiving any warning, whether positively or negatively framed, would

increase nocebo cybersickness relative to no warning, while receiving a positively framed warning was hypothesised to reduce nocebo cybersickness relative to a negatively framed warning. Regarding the interaction between observational learning and framing, if observational learning is as sensitive to framing effects as instructions, then no interaction should emerge. However, if observational learning is less sensitive to framing effects than instructions, then an interaction should emerge whereby positive framing is less effective following observational learning. Anxiety and expectancy, as candidate mechanisms underlying the effects of observational learning and attribute framing on nocebo effects, were hypothesised to follow the same between group patterns as nocebo cybersickness and were hypothesised to predict cybersickness.

Method

Pre-Registration

This study and all analyses were pre-registered on AsPredicted. https://aspredicted.org/blind.php?x=i8e6y6

Participants

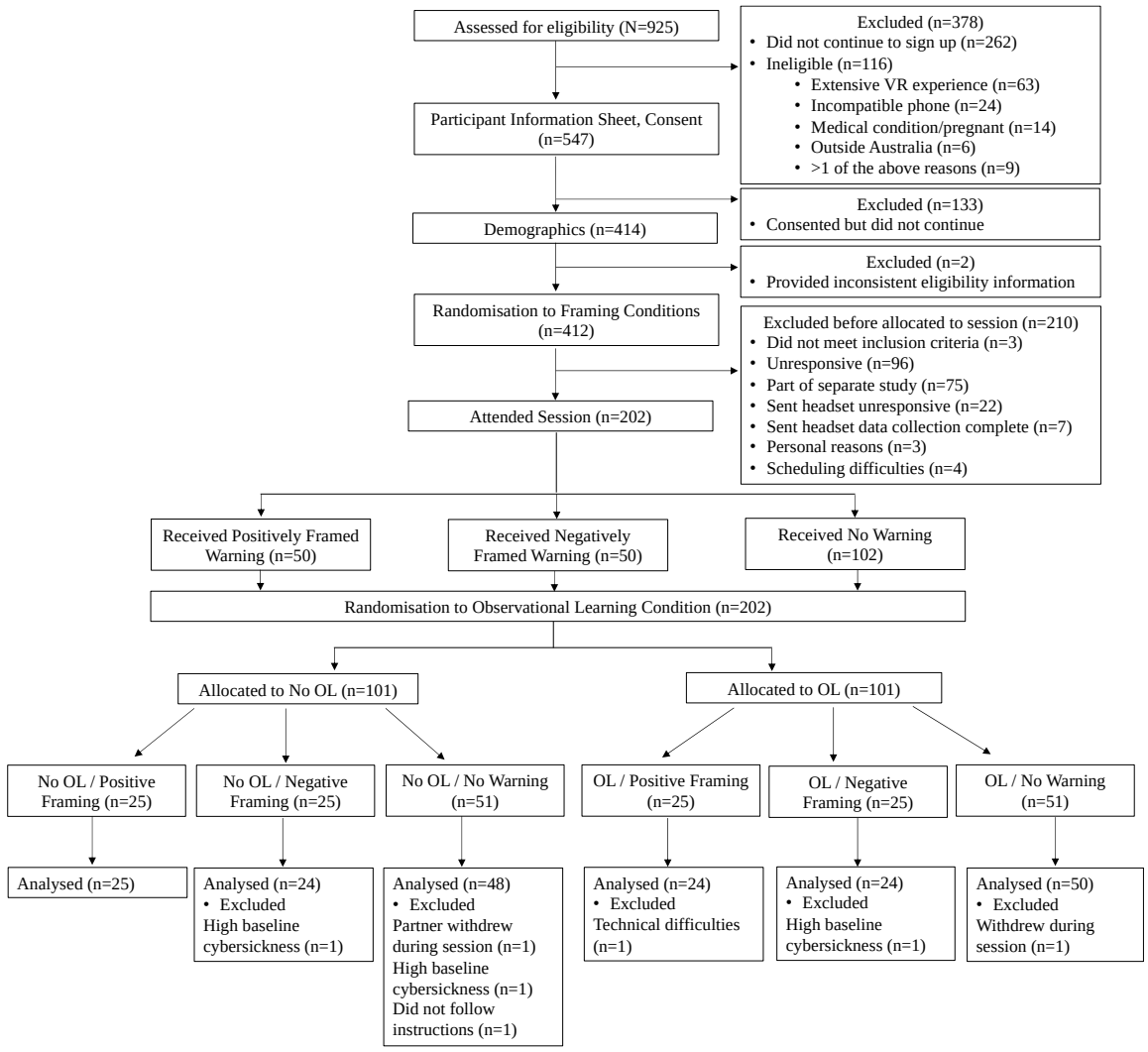
Participants were recruited via Facebook advertising and the Sydney University CareerHub. To be eligible, participants were required to be between 17 and 60 years of age, live in Australia, and have a smartphone with screen size between 4.1 and 6.1 inches and the latest version of the YouTube application installed on the device (for use in the VR headset). Exclusion criteria were having used VR for more than ten hours, being pregnant, having epilepsy, having a pacemaker or pre-existing binocular abnormalities, having an ear infection or migraine at the time of testing, demonstrating high baseline cybersickness (three standard deviations above the mean), or having a medical condition that affects postural stability or increases the risk of nausea. Figure 3 shows the flow of recruitment. A total of 412 participants completed the sign-up process, which entailed eligibility screening and providing

consent and demographic information. Two hundred and ten people who signed up did not participate in the study primarily due to being unresponsive to emails or being randomised to a separate study the current research was run in parallel to [1] (see Figure 2 for full details). The final sample comprised 195 participants (118 female). The age range of the final sample was 18 to 49 (M = 26.15, SD = 5.68). The study was approved by the University of Sydney Human Research Ethics Committee (Appendix A).

[1] The separate study was run by another honours student and investigated generational OL effects. This collaboration was a result of COVID-19 disrupting initial plans to run separate lab-based studies. However, by combining the two studies, the other honours student could serve as the confederate in the Zoom sessions while I served as the researcher. This allowed us to run two separate studies concurrently that only shared OL and no OL control (no warning) group data. In all, this meant that I conducted >100 live Zoom sessions lasting approximately 45-60min with >300 participants. ~200 participants contributed data to the current study and ~100 of those uniquely so (the positive and negative framing groups). This approach was approved by the Honours Co-ordinator.

Figure 2

CONSORT Flow Diagram



Note. N=total participants, n=participants per group, OL=observational learning.

Design

The current research ostensibly sought to investigate the effects of online learning in VR on memory. The true purpose, however, was to investigate the effects of side effect framing and observational learning (OL) on nocebo side effects, using a model of VR-induced cybersickness. The study used a 3x2 between-subjects design with side effect warning and OL as factors manipulated prior to viewing a VR video, as shown in Table 1. Participants were first randomised to one of three side effect warnings: positive framing (7 in

10 chance of *not* experiencing cybersickness), negative framing (3 in 10 chance of experiencing cybersickness), and no warning. Participants were then randomised to either witness a confederate modelling cybersickness symptoms (observational learning) or to not witness such modelling (no observational learning). Therefore, the six experimental groups were 1) positively framed warning with no OL, 2) positively framed warning with OL, 3) negatively framed warning with no OL, 4) negatively framed warning with OL, 5) no warning with no OL, and 6) no warning with OL. The primary dependent variable was self-reported cybersickness before and after VR exposure. Secondary dependent variables were self-reported expectancy of experiencing cybersickness and anxiety, and the nausea subscale of the primary cybersickness outcome.

Table 1

3x2 Experimental Design

		Observational Learning	
		No OL	OL
Framing	Positive Frame	No OL with Positive Framing	OL with Positive Framing
	Negative Frame	No OL with Negative Framing	OL with Negative Framing
	No Warning	No OL with No Warning	OL with No Warning

Note. OL= observational learning.

Materials and Measures

VR Videos

The VR videos were sourced from YouTube and approved for use in the study by the creators, see Appendix B. The target video was a VR format rollercoaster simulator, as shown in Figure 3. The video featured realistic visual and audio rollercoaster elements with

rapid pace and turbulence, closely resembling the real-life experience. The second – distractor – video was a VR tour of Paris, featuring several iconic landmarks. Participants watched both videos with their own phones and headsets, using VR mode in the YouTube app. This mode utilises the smartphone gyroscope and accelerometer and allows participants' head movements to simulate looking around the virtual environment. The videos were identical for all participants, though depending on their head movements, participants could explore the virtual environment visually to different extents.

Figure 3

Screenshot of the Cybersickness Inducing VR Video

Framing Manipulation

The key side effect of interest was cybersickness, which was described to participants using three key symptoms: nausea, general discomfort, and sweating. These symptoms were chosen for four important reasons. First, they map onto items of the cybersickness scale used as the primary outcome (see below); second, these symptoms are likely to be more familiar to participants than the term cybersickness alone; third, they were the top three symptoms increased by VR exposure in Mao et al. (in press) (see Appendix C); and fourth, it is uncommon to be warned of just one side effect prior to commencing a procedure or treatment (Tan et al., 2014). All participants received a non-statistical warning via the study

advertisements (Appendix D & E) and participant information statement (PIS) (Appendix F). During the study, participants in the positive and negative framing conditions received additional warnings, displayed on screen and read aloud to them, under 'Information about Virtual Reality' (Appendix G1-3). The warnings were also displayed at the beginning of the rollercoaster VR video. The full warning can be found in Appendix G1-3. The critical manipulation, however, was the framing. The warning contained different statistical information between the positive and negative framing groups, as shown in Table 2. Participants in the no warning condition did not receive an additional warning during the study.

Table 2

Cybersickness Warnings for Each Group

Group	Framed Warning
Positive Framing	From previous research, we typically find that 7 out of 10 people will **not** experience cybersickness to a level that bothers them. If you do experience any of these symptoms, they will pass soon after you take the headset off.
Negative Framing	From previous research, we typically find that 3 out of 10 people will experience cybersickness to a level that bothers them. If you do experience any of these symptoms, they will pass soon after you take the headset off.
No Warning	No information provided.

Note that the positively and negatively framed warnings featured low absolute risk. That is, the warnings communicated a low overall chance of experiencing cybersickness (i.e. 3 out of 10). Low absolute risk was elected as evidence maintains that when side effects are

communicated with high absolute risk (i.e 7 out of 10 people will experience side effects vs 3 out 10 will not) attribute framing effects fail to emerge (e.g. Caplandies et al., 2017; Devlin et al., 2019). However, when side effect warnings feature low absolute risk, as utilised in the current study, attribute framing effects emerge more reliably, with evidence supporting this effect in OL of nocebo side effects (e.g. Faasse et al., 2015; Faasse et al., 2018).

Simulator Sickness Questionnaire (SSQ)

The SSQ (Appendix H) is a 16-item questionnaire for assessing simulator sickness, developed from data spanning different simulators (Kennedy et al., 1993). Respondents rate their current experience of a specific symptom or sensation (e.g. nausea, general discomfort, sweating, burping). The response scales were modified in the current study from the original four-point scale to an 11-point scale, where 0 corresponds to not at all and 10 corresponds to severely, as per the response scale used in Barnes, Yu, et al. (2019). The SSQ features the three subscales of Nausea, Oculomotor Disturbance, and Disorientation, which are consistent with the factor structure of the questionnaire (Kennedy et al., 1993). In the current study, participants' SSQ scores were used to operationalise cybersickness, with the difference between SSQ composite scores pre and post-VR as the primary outcome. While the SSQ features three subscales, it is more common to analyse the composite SSQ scores (Barnes, Yu, et al., 2019; Mao et al., in press; Min et al., 2004; Moss & Muth, 2011). Furthermore, with the possibility of the effect of warnings (Faasse, Huynh, et al., 2019) and OL (Faasse et al., 2015; Faasse et al., 2018) generalising to other symptoms, it was decided a priori to make the composite SSQ score the primary cybersickness outcome, with the nausea subscale the secondary cybersickness outcome (Appendix H).

Short-form State-Trait Anxiety Inventory (STAI-6)

The STAI-6 (Appendix I) is a 6-item index of state anxiety. The scale is well established, sensitive to changes in anxiety, and when compared to the long-form STAI,

demonstrates respectable concurrent validity and reliability (Cronbach's alpha = 0.82) (Marteau & Bekker, 1992). Items, such as "I am tense" are rated on a 4-point scale ranging from "not at all" to "very much" with respondents instructed to "indicate how you feel right now, at this moment".

Expectancy

The expectancy question in the current study was based on previous research evidencing effects of attribute framing on expectancy (Mao et al., in press; O'Connor et al., 1996). The question was specifically phrased to ascertain participants' expectation of personally experiencing cybersickness from the VR video. Participants were asked "How much do you expect to experience feelings of cybersickness (e.g. nausea, general discomfort, sweating) during the Virtual Reality video?", and responded on an 11-point scale with accompanying descriptors ranging from 0, corresponding to not at all, to 10, corresponding to strongly (Appendix J).

Manipulation Check

Before the end of the study, participants completed a manipulation check which comprised four questions (Appendix K). First, participants were asked "Do you remember being warned about cybersickness being a possible side effect of using the Virtual Reality Headset?" with yes or no as response options. If they responded yes, participants were instructed "Please fill in the information you were told about experiencing cybersickness as a side effect of Virtual Reality.", an open-ended response. Next participants were asked to recall the side effect warning statistic from four options: "From previous research, 7 out of 10 people will not experience cybersickness at a level that bothers them.", "From previous research, 3 out of 10 people will experience cybersickness to a level that bothers them.", "From previous research, a proportion of people will experience cybersickness to a level that bothers them.", or "I did not receive any of the above statements.". Participants then gave an

open-ended response to the question “What do you think the purpose of this experiment was?”.

Procedure

Recruitment and Consent

Participants were led to believe the purpose of the study was to investigate the effect of online learning in VR upon memory. Participants first underwent eligibility screening. If eligible, they could proceed to the PIS and consent form (Appendix L). The PIS, in line with ethical obligations, contained a warning about experiencing cybersickness during VR. Following providing consent, participants completed a demographics questionnaire (Appendix M), and were then randomly assigned to receive a positively framed, negatively framed, or no side effect warning. This allowed for scheduling of participants together in their respective framing conditions for the sessions. Participants were scheduled in groups of two[2], with the confederate. Following session confirmation, participants were posted a smartphone VR headset (which was then theirs to keep) and were emailed instructions to not use the headset prior to the session, other than to calibrate it following a video made by the research team (see Appendix B). Participants were also told to not eat the hour before the session.

Phase 1 - Introduction to Main Zoom Session

For the sessions, participants attended a one-hour Zoom video call. A general overview of the procedure is shown in Figure 4. First, participants were given a general overview of the study, both verbally and with information displayed on a shared screen via PowerPoint. Next, participants received a unique participant identification number and

[2] The no warning group had two additional participants who contributed data to the separate study on generational observational learning (see footnote 1 for more details). Since the focus for the current study is on the first two participants, all procedures refer only to those participants.

completed the baseline questionnaires (SSQ, STAI-6, and expectancy) via Qualtrics. Following baselines, participants were randomised to either receive OL or no OL. 'Information about Virtual Reality', which reinforced the cover story, was then displayed via shared screen to participants, and the experimenter read the information aloud. Depending on the framing condition, this information contained the warning manipulation highlighting either the likelihood of experiencing (negative frame) or not experiencing (positive frame) cybersickness, or no warning.

Phase 2 - Target Video

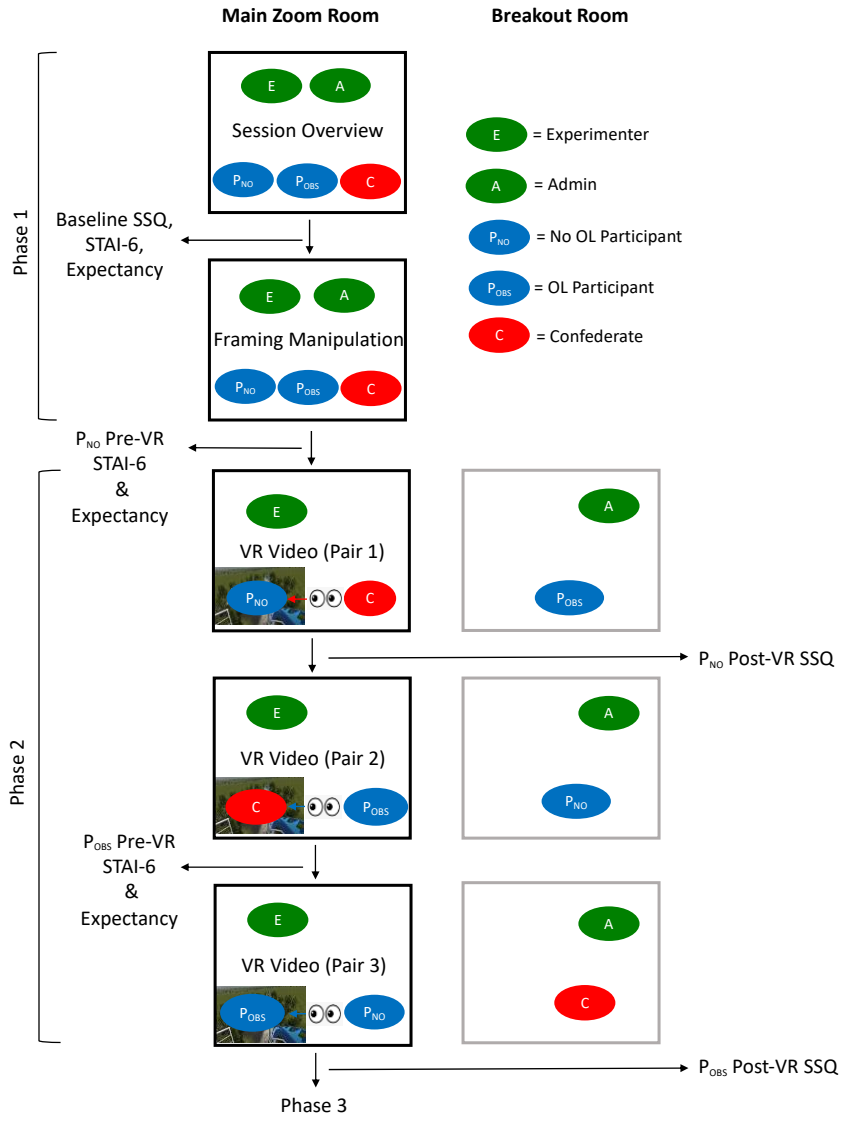
The first part of the study ostensibly investigated online learning in pairs, though in fact involved the OL manipulation. Here, participants entered a waiting room - a Zoom breakout room - monitored by the other experimenter under the guise of an 'Admin' (A) account. Participants were instructed to mute their microphones and webcams in the waiting room and to not communicate with one another. All participants returned to the main room, successively, to watch the VR videos in the presence of the experimenter (E) and another participant.

The 'no OL' participant (P_{NO}) experienced the first VR video in the presence of the confederate (C), having only received their respective framing warning. Next, the confederate watched the VR video, with the 'OL' participant (P_{OBS}) as the observer. The confederate followed a script throughout their VR experience which emphasised the cybersickness symptoms of sweating, general discomfort, and nausea (Appendix N). P_{OBS} then watched the first VR video with P_{NO} as the observer in positive and negative framing sessions, or a different participant serving the separate study in no warning sessions. Immediately prior to their first VR experience, each participant completed the expectancy and STAI-6 questionnaires to investigate any changes in anxiety and expectancy generated by the framing

warning and/or OL. Immediately after their VR experience, participants individually answered the SSQ to investigate changes in cybersickness elicited by the VR experience.

Figure 4

Procedure Flow



Phase 3 - Distractor Video and Manipulation Check

The second part of the study served to reinforce the cover story, ostensibly investigating online learning in groups. Together in the main Zoom room, all participants watched the second video simultaneously using their individual headsets. Participants then

collectively answered five questions about the video, for cover story consistency (Appendix O). Before the conclusion of the study, participants individually completed the framing memory check and the manipulation check (Appendix K). Upon completion of data collection, participants were debriefed via email (Appendix P).

Power and Data Analysis

Based on the effect size from Barnes, Yu, et al. (2019) - a between-subjects design where cybersickness symptoms were induced via Galvanic Vestibular Stimulation and Virtual Reality - it was predicted that 25 participants would be required per cell (N = 150). As noted above, the current study shared two (of six) groups with a separate study on generational OL of nocebo effects, which required larger sample per group. The two groups of the current study, i.e. the no warning groups, therefore, had 51 participants per group (N = 202).

All demographic and baseline measures were tested for between-group differences to determine whether randomisation had successfully distributed participants across groups evenly. Chi-Square tests of independence were performed for categorical variables, and two-way analyses of variance (ANOVA) were conducted for continuous variables. If group differences were significant at the $p < .1$ level, they were controlled for in the main analyses.

For the main analyses, composite SSQ scores were calculated as the difference between a participant's baseline and post-VR measures. For secondary analyses, anxiety and expectancy scores were calculated, separately, as the difference between a participant's baseline and pre-VR measures. Nausea scores were calculated as the difference between a participant's baseline and post-VR SSQ nausea subscale measures. To determine whether cybersickness symptoms, anxiety, and expectancy differed between groups, two-way analyses of covariance (ANCOVA) were conducted on the difference scores to test the main effects of OL and framing, and interaction effects between OL and framing. Gender was

entered as the covariate for all analyses involving OL effects, as evidence suggests that OL of nocebo effects is sensitive to the gender of the model and observer, such that females report greater socially induced nocebo effects than males (Lorber et al., 2007; Świder & Bąbel, 2013).

For each set of results, a set of planned orthogonal contrasts was also conducted for framing. The first contrast compared the no warning group to positive and negative framing groups, on average, to determine whether receiving any warning within the study, regardless of framing, increased cybersickness relative to only receiving a non-statistical warning before the study (i.e. no warning during the study). The second contrast compared positive and negative framing to determine whether receiving a positively framed warning reduced cybersickness relative to negative framing. Interaction contrasts were also conducted, comparing each framing contrast across the two levels of OL.

Separate multiple linear regressions were performed to determine the extent to which anxiety and expectancy predicted cybersickness, controlling for gender. Mediation analysis was also performed to test whether expectancy and anxiety mediated any significant group effects on SSQ composite and/or nausea scores, controlling for gender. All statistical analyses were conducted using IBM SPSS Statistics Version 26. The threshold of significance was set at $p < .05$ for all analyses.

Results

Baseline and Demographics

All baseline and demographic characteristics were examined for between-group differences prior to conducting the main analysis. Demographic characteristics for each group are displayed in Table 3. There were no significant differences between groups in gender, *Fisher's exact test* = 10.752, $p = .276$, *Cramer's V* = .180, nor age, $F(5,189) = .557$, $p = .733$, or VR experience, $F(5, 189) = 1.105$, $p = .359$.

Baseline measures for each group are also displayed in Table 3. Two-way ANOVAs revealed no statistically significant main effect of framing, OL, or interaction between OL and framing, for baseline composite SSQ, STAI-6, and expectancy scores, highest $F(2, 187) = 1.68$, $p = .189$. No demographic or baseline measure reached $p < .1$, therefore none were included as covariates in subsequent analyses.

Table 3

Mean and Standard Error of Baseline Measures and Demographic Factors for Each Group

		No Observational Learning			Observational Learning		
		No Warning	Positive Framing	Negative Framing	No Warning	Positive Framing	Negative Framing
Age	Mean	26.3	24.9	27.2	26	26.9	25.5
	S.E.	.83	1.14	1.17	.81	1.17	1.17
Gender	Female	25	15	5	31	12	16
	Male	23	10	19	17	12	8
	Other	0	0	0	2	0	0
VR Experience	Mean	1.07	1.07	.82	1.55	.97	1.79
	S.E.	.28	.38	.39	.27	.39	.39
Composite SSQ	Mean	8.94	10.64	7.21	9.76	7.38	7.88
	S.E.	1.35	1.87	1.91	1.32	1.91	1.91
STAI-6	Mean	9.81	9.52	9.17	9.94	9.13	9.00
	S.E.	.38	.52	.54	.37	.54	.54
Expectancy	Mean	2.69	3.28	2.54	2.68	2.29	2.88
	S.E.	.35	.48	.49	.34	.49	.49

Cybersickness

Composite SSQ

The prespecified primary cybersickness outcome was composite SSQ scores, as shown on the left panel of Figure 5. These scores were calculated as the difference between ratings before and after VR, across groups. A two-way ANCOVA found no significant differences in covariate adjusted mean (M_A) cybersickness – that is, cybersickness controlling for gender - between OL and no OL groups, averaged across framing groups, $F(1, 187) = 3.11$, $p = .079$. The ANCOVA also revealed no significant differences in cybersickness between framing groups, averaged across OL groups, and no interaction between OL and framing, highest $F(2, 187) = 1.34$, $p = .264$. Planned orthogonal framing contrasts revealed no significant differences between no warning and positive and negative framing groups, on average, or between positive and negative framing, nor significant interaction contrasts, highest $F(1, 187) = 1.59$, $p = .210$. These results indicate cybersickness was not affected by OL or attribute framing directly, or through an interaction.

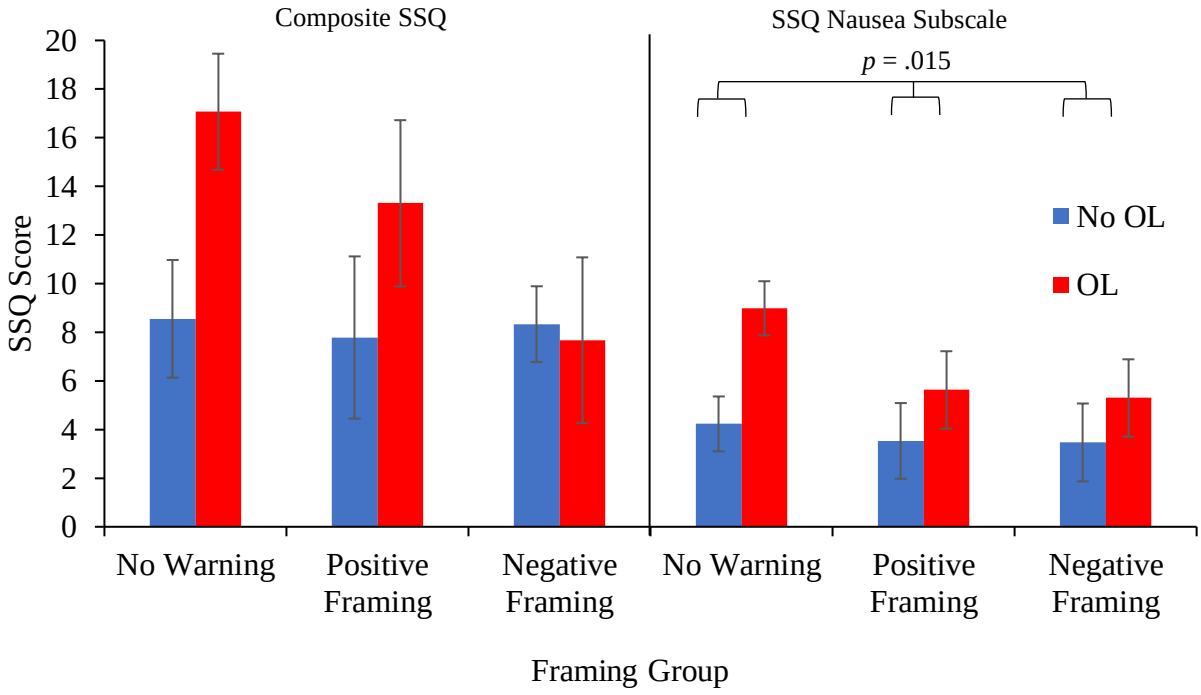
Nausea Subscale

The prespecified secondary cybersickness outcome was SSQ nausea subscale scores, shown on the right panel of Figure 5. SSQ nausea scores were calculated as the difference between nausea subscale ratings before and after VR, across groups. A two-way ANCOVA found that nausea scores were significantly higher following OL ($M_A = 6.64$), compared to no OL ($M_A = 3.74$), averaged across framing groups, $F(1, 187) = 6.02$, $p = .015$. The ANCOVA also revealed no significant differences in cybersickness between framing groups, averaged across OL groups, and no interaction between OL and framing, highest $F(2, 187) = 1.80$, $p = .168$. Planned orthogonal contrasts revealed no significant differences between positive and negative framing, nor significant interaction contrasts, though there was a trend towards nausea being greater following no warning compared to positively and negatively

framed warnings, on average, however this did not reach significance, $F(1, 187) = 3.60$, $p = .059$. These results indicate that OL significantly increased nausea relative to no OL, however framing failed to affect nausea directly, or through an interaction.

Figure 5

Mean composite SSQ (left) and nausea subscale (right) scores (N=195). Error bars represent SE of the mean. Higher scores represent greater self-reported symptoms post VR. Composite Scores Could Range from 0-176; Nausea Scores Could Range from 0-77.



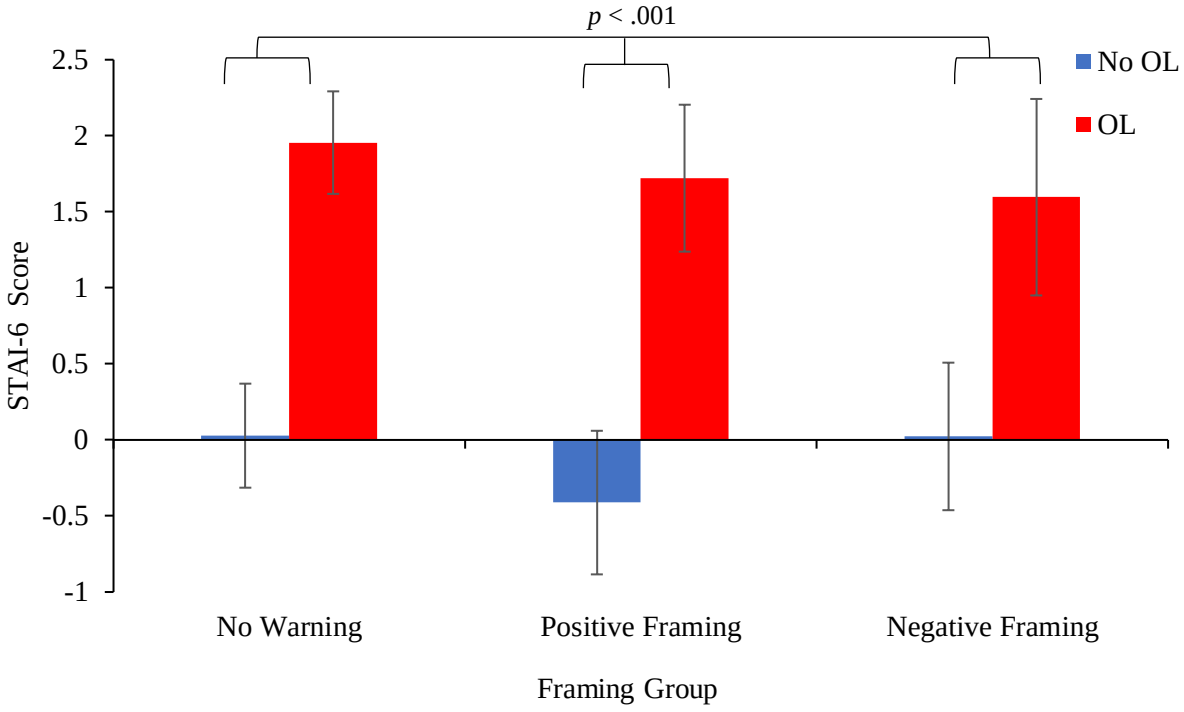
Anxiety

STAI-6 scores - indexing anxiety - were calculated as the difference between baseline and pre-VR ratings and are displayed in Figure 6. A two-way ANCOVA found a significant main effect of OL such that anxiety was significantly higher following OL ($M_A = 1.76$) compared to no OL ($M_A = -.120$), averaged across framing, $F(1, 187) = 27.63$, $p < .001$. No main effect of anxiety, or an interaction between OL and framing was revealed, highest $F(2, 187) = .35$, $p = .707$. The planned orthogonal contrasts were not significant, nor were the interaction contrasts, highest $F(1, 187) = .59$, $p = .445$. This suggests that OL of

cybersickness symptoms increased anxiety compared to no OL, however the framing of the cybersickness warning did not influence anxiety directly, or through an interaction.

Figure 6

Mean STAI-6 Scores (N=195). Error bars represent SE of the mean. Higher scores represent increased anxiety and scores could range from 0-24



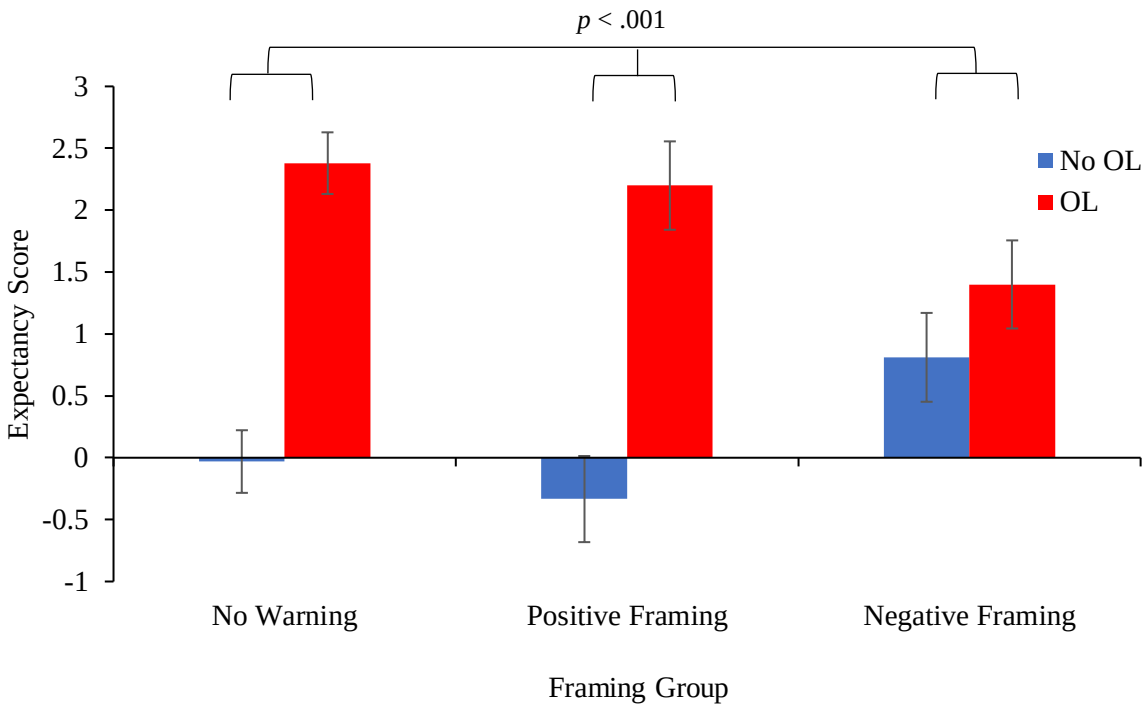
Expectancy

Expectancy of cybersickness scores were calculated as the difference between baseline and pre-VR ratings and are displayed in Figure 7. A two-way ANCOVA revealed a main effect of OL. Expectancy was significantly greater following OL (M_A = 2.0) compared to no OL (M_A = .15), averaged across framing, $F(1, 187) = 48.81$, $p < .001$. No main effect of framing was found, $F(2, 187) = .31$, $p = .73$, and no planned orthogonal contrasts reached significance, highest $F(1, 187) = .38$, $p = .546$. However, a significant interaction between OL and framing was found, $F(2, 187) = 5.15$, $p = .007$. Interaction contrasts revealed that this interaction was driven by a significantly greater difference in expectancy scores between no OL and OL within positive framing compared to negative framing, $F(1, 187) = 7.55$, $p =$

.007. The other interaction contrast was not significant, $F(1, 187) = 2.83$, $p = .094$. Post-hoc simple effects analysis found that expectancy was significantly greater following OL compared to no OL within no warning $F(1, 187) = 45.63$, $p < .001$, and positive framing, $F(1, 187) = 25.84$, $p < .001$, groups however not within negative framing, $p = .24$. These results indicate that OL increases expectancy of cybersickness relative to no OL, and this effect is significantly more pronounced when warnings are positively framed compared to negatively framed.

Figure 7

Mean Expectancy Scores (N=195). Error bars represent SE of the mean. Higher scores represent increased expectancy and scores could range from 0-10



Predictors and Mediators of Cybersickness

Predictors of Composite SSQ

Separate multiple linear regressions were performed to assess the extent to which anxiety and expectancy predicted composite cybersickness scores, controlling for gender. Anxiety uniquely accounted for 4.7% of the variance in SSQ scores, $R^2 = .047$, $F(1, 192) =$

9.66, $p = .002$, and was a significant predictor of cybersickness. For every unit increase in anxiety scores, cybersickness scores were predicted to increase by 1.47 points ($SE_b = .47$, $t(192) = 3.11$, $p = .002$). Expectancy uniquely accounted for 6.3% of the variance in SSQ scores, $R^2 = .063$, $F(1, 192) = 13.00$, $p < .001$, and was a significant predictor of cybersickness. For every unit increase in expectancy scores, cybersickness scores were predicted to increase by 2.10 points ($SE_b = .58$, $t(192) = 3.61$, $p < .001$).

Predictors of Nausea Subscale

Separate multiple linear regressions were performed to assess the extent to which anxiety and expectancy predicted nausea subscale scores, controlling for gender. Anxiety uniquely accounted for 4.1% of the variance in nausea scores, $R^2 = .041$, $F(1, 192) = 9.66$, $p = .006$, and was a significant predictor of nausea. For every unit increase in anxiety scores, nausea scores were predicted to increase by .62 points ($SE_b = .22$, $t(192) = 2.79$, $p = .006$). Expectancy uniquely accounted for 8.2% of the variance in nausea scores, $R^2 = .082$, $F(1, 192) = 17.44$, $p < .001$, and was also a significant predictor of nausea. For every unit increase in expectancy scores, nausea scores were predicted to increase by 1.13 points ($SE_b = .27$, $t(192) = 4.18$, $p < .001$).

Mediation Analysis

Since OL affected nausea, and nausea was predicted by expectancy and anxiety, separate mediation analyses were conducted to investigate whether the relationship between OL and nausea was mediated by expectancy and/or anxiety. The mediation models included OL as the independent variable, VR-induced nausea as the DV, and expectancy or anxiety difference scores as the mediator, controlling for gender. As shown in Figure 8, expectancy completely mediated the effect of OL on nausea, direct effect = 1.34, 95% CI = [-1.34, 3.81], $p > .05$ and indirect effect = 1.91, 95% CI = [.75, 3.18], $p < .05$. Anxiety, however, did not mediate the effect of OL on nausea, direct effect = 2.42 95% CI [.06, 4.8], $p < .05$, and

indirect effect = .83 95% CI = [-.21, 2.15], $p > .05$, see Figure 9. See Appendix Q for full output. This indicates that despite expectancy and anxiety predicting VR-induced nausea, only expectancy mediated the effect of OL on VR-induced nausea.

Figure 8

Mediation Model Depicting the Relationship Between Observational Learning, Expectancy, and Nocebo Nausea. Unstandardised Coefficients are shown. Note: OL groups were coded as 0=no OL and 1=OL; * $p < .05$, ** $p < 0.001$.

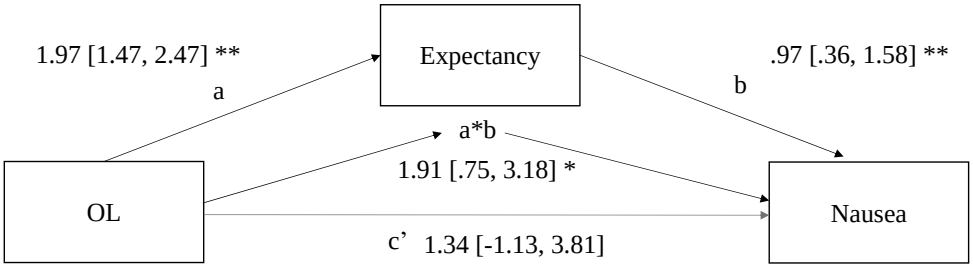
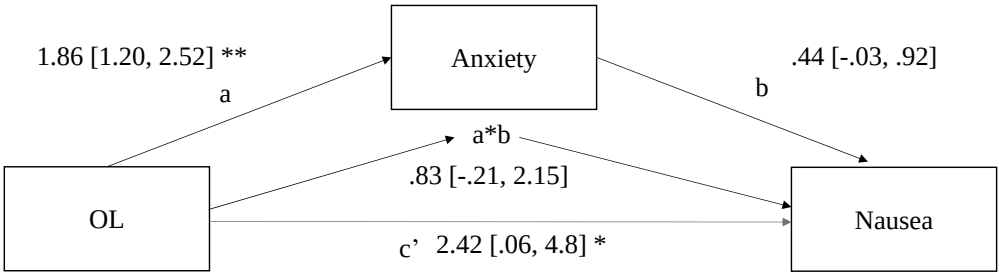


Figure 9

Mediation Model Depicting the Relationship Between Observational Learning, Anxiety, and Nocebo Nausea. Unstandardised Coefficients are Shown. Note: OL groups were coded as 0=no OL and 1=OL; * $p < .05$, ** $p < 0.001$



Moderation Analyses

Moderation analyses were conducted to investigate whether the relationships between anxiety and cybersickness, expectancy and cybersickness, anxiety and nausea, and

expectancy and nausea differed across groups. Separate hierarchical multiple regressions were performed. In step one, anxiety or expectancy and gender were entered. In step two, the framing and OL interventions, and the interactions between the interventions were entered. In step three, two-way interactions between the interventions and anxiety or expectancy were entered alongside the three-way interactions between anxiety or expectancy and two way-framing/OL interactions.

The pattern of results revealed by this analysis was the same for anxiety and expectancy. Anxiety and expectancy remained significant when controlling for gender, the interventions, and the interaction between the interventions, suggesting that the relationship between anxiety and cybersickness, and expectancy and cybersickness, was the same across all groups. Neither anxiety or expectancy significantly interacted with framing, OL, or the two-way interactions between framing and OL, highest $t(182) = 1.23$, $p = .222$. Therefore, the relationships between anxiety and cybersickness, and expectancy and cybersickness were not moderated by group. The pattern of results for relationships between anxiety and expectancy with the nausea subscale scores were the same. See Appendix Q for complete output.

Manipulation Check

Purpose of the Study

The majority of participants (98.5%) did not indicate knowledge of the true purpose of the experiment. Whether participants indicated true knowledge of the purpose did not differ between groups $\chi 2 = 4.99$, ($df = 5$, $N = 195$), $p = .418$. The three participants who did indicate knowledge of the purpose received OL: one received negative framing, and two received no warning.

Recall Accuracy

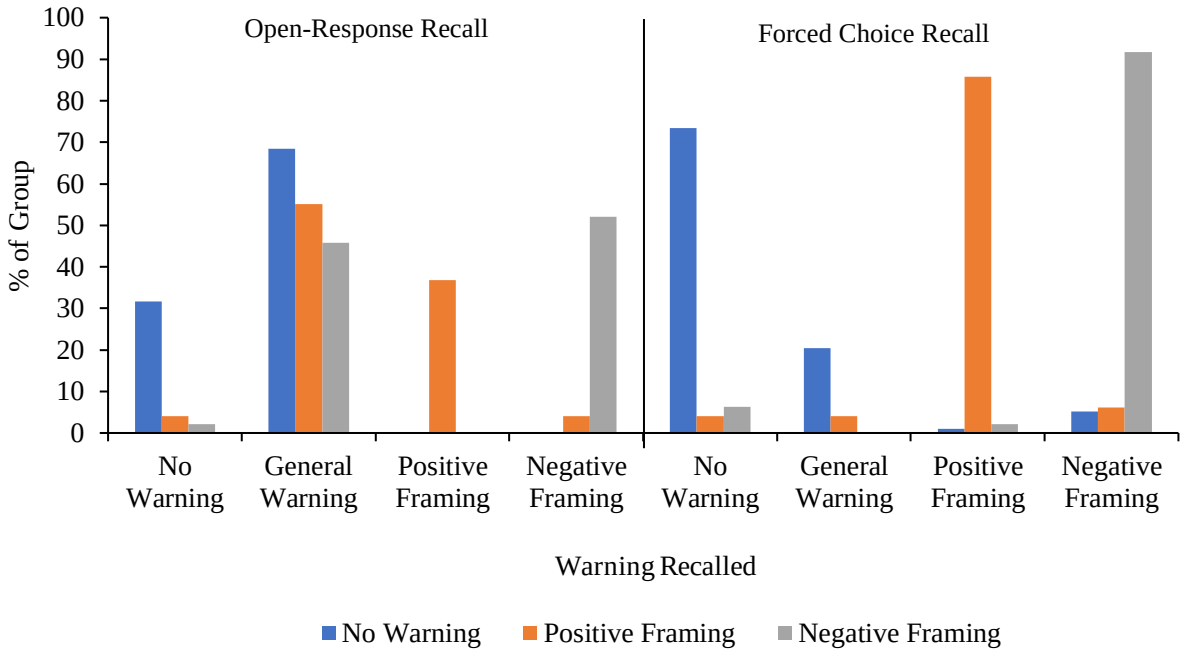
Open Recall. The first recall question was an open response question about what participants recalled being warned about cybersickness. Coded responses are shown in the

left panel of Figure 10. The Chi-Square test shows that participants' recall differed between groups, $\chi 2 = 147.05$, ($df = 6$, $N = 195$), $p < .001$. This result indicates that the framing manipulation did influence what participants were able to recall as intended. However, only 37% of positive and 52% of negative framing participants correctly recalled their respective cybersickness warnings, suggesting recall was far from perfect.

Forced Choice Recall. The second recall question was forced choice; participants chose, from four options, which statement was presented at the beginning of the VR video. Responses are shown in the right panel of Figure 10. Participants forced choice recall also differed significantly between groups, $\chi 2 = 289.05$, ($df = 6$, $N = 195$), $p < .001$. This suggests that framing also influenced forced choice recall, though accuracy was much higher for forced choice than open recall, with 73% of no warning, 86% of positive framing, and 92% of negative framing participants recalling the correct statement.

Figure 10

Warning Types Recalled by Participants in Open-Response (Left) and Forced Choice (Right) Recall Across Framing Groups (N=195)



Sensitivity Analysis

Post-hoc sensitivity analyses were performed since 63% of positive and 48% of negative framing participants incorrectly recalled their respective cybersickness warnings in open recall. Separate sensitivity analysis of composite SSQ and nausea subscales were performed, excluding participants with incorrect open recall in one model and participants with incorrect forced choice recall in another model. Results however did not change. Across both models, the main effect of OL on the nausea subscale remained significant however no other effects or interactions were significant, highest $F(1, 134) = 2.77$, $p = .098$.

Discussion

The current study investigated whether the benefits of positive attribute framing extend to nocebo side effects induced via OL, using a model of VR-induced cybersickness. The current study found no interaction between OL and framing on cybersickness, and hence no evidence that positive framing can attenuate observationally induced nocebo side effects. Opposing predictions, OL and framing also failed to affect composite cybersickness scores directly. However, OL did increase VR-induced nausea specifically, though framing did not. The roles of anxiety and expectancy as candidate mechanisms underlying the effects of framing and OL on nocebo side effects, and nocebo side effects generally, were also investigated. Anxiety and expectancy were not affected by framing, opposing predictions, however, were elevated following OL relative to no OL, as hypothesised. Between OL group differences in anxiety and expectancy matched that of subsequent nausea, as hypothesised, but not cybersickness, opposing hypotheses. Nocebo side effects emerged in the current study through the elevation of nausea following OL, therefore, inferences can be drawn regarding mechanisms underlying the OL of nocebo side effects, however the lack of framing effects obstruct inferences regarding mechanisms underlying framing effects. Moreover, anxiety and expectancy predicted cybersickness and nausea, irrespective of group, and are therefore

implicated as mechanisms of cybersickness and nausea, generally. Notably, expectancy, but not anxiety, completely mediated the effect of OL on nocebo nausea, suggesting causal influence. Concerningly, participants' recall of cybersickness warnings was poor. While hypotheses were not formulated about recall, this finding diverges from previous framing studies. Each of these findings will be discussed in turn.

Observational Learning

Effect on VR-Induced Cybersickness and Nausea

Opposite to predictions, the current study failed to find an effect of OL on composite VR-induced cybersickness. This finding is inconsistent with studies that uniformly demonstrate observationally induced primary nocebo effects (Faasse et al., 2015; Faasse et al., 2018; Koban & Wager, 2016; Vögtle et al., 2013; Vögtle et al., 2016; Vögtle et al., 2019) and nocebo side effects (Faasse et al., 2015; Faasse et al., 2018). However, the prespecified secondary outcome of VR-induced nausea was increased following OL, demonstrating observationally induced nocebo side effects in an online environment for the first time and aligning with the aforementioned studies.

The disparity in the effects of OL on composite cybersickness and nausea may be attributable to the OL manipulation. Participants allocated to the OL condition witnessed the confederate model the cybersickness symptoms of nausea, general discomfort, and sweating, which are items of the SSQ nausea subscale. As mentioned, the composite SSQ was chosen as the primary outcome, with the nausea subscale as the secondary outcome, based on evidence that OL of nocebo side effects can generalise to other symptoms (Faasse et al., 2015; Faasse et al., 2018). However, the effect of OL on the nausea subscale only suggests, instead, that symptoms do not generalise. Future studies should therefore consider using a subscale as the primary outcome if target symptoms correspond to a subscale specifically.

Mechanisms of Observational Learning Effects

Expectancy. As predicted, OL increased participants' expectancy relative to no OL. This finding aligns with Bandura's social learning theory (1977) and Kirsch's response expectancy theory (1985) which assert that expectancies are acquired and modified via OL. This result is also consistent with Vögtle et al. (2019) who found observation of painful facial expressions influenced expectancy of pain. The current result extends existing literature by demonstrating that OL influences expectancies in cybersickness, a symptom dimension beyond hyperalgesia.

The between-group pattern of expectancies matched that of subsequent nausea, in line with hypotheses, but not composite cybersickness, opposing hypotheses. This disparity may be attributable to different underlying expectancies being elicited. Participants were asked "To what extent do you expect to experience cybersickness symptoms … (e.g. nausea, general discomfort, and sweating)". Those example symptoms match to the nausea subscale and were modelled by the confederate. The implication of this is twofold. First, the expectancy question may have inadvertently indexed expectancy of nausea subscale symptoms, rather than composite cybersickness symptoms. Second, as observation is purportedly involved expectancy acquisition (Bandura, 1977; Kirsch, 1985) and expectancies are theorised to produce responses (Kirsch, 1985, 2018), observing the confederate model those symptoms may have aroused expectancies, and therefore responses, for those symptoms exclusively. This may account for OL affecting nausea but not composite cybersickness and may suggest that expectancies underlying OL effects on nocebo side effects do not generalise, though we did not test this.

Anxiety. OL elevated participants' anxiety relative to no OL, as hypothesised. This result diverges from past studies which have found no differences in anxiety between nocebo and control groups (Vögtle et al., 2013; Vögtle et al., 2016; Vögtle et al., 2019). However, of

these studies, only Vögtle et al. (2013) indexed participants' anxiety at time of testing. The others indexed anxiety symptoms over the past week, which does not allow insight into participants' anxiety at the time of testing, and – critically – any effect of OL on anxiety. Conclusions regarding OL effects on anxiety in those studies are therefore obstructed compared to the current study which assessed anxiety before and after the OL manipulation, thereby allowing insight into any effect of the OL manipulation. The disparity between findings of the current study and Vögtle et al. (2013) may be attributable to differences in modelling procedures; participants in Vögtle et al. (2013) viewed a pre-recorded video of a confederate giving numerical pain ratings. Participants in the current study, however, viewed the confederate's cybersickness modelling live, constituting a more ecologically valid modelling procedure which may have contributed to the successful elicitation of anxiety. Moreover, the disparity in findings could also be due to anxiety exerting different mechanistic influence within the symptom domain of nausea compared to pain. The current evidence cannot confirm this, though Wolters et al. (2019) suggests the influence of mechanisms underlying nocebo effects may differ across nocebo symptom domains.

The OL between-group pattern of anxiety was matched with that of subsequent nausea, in line with hypotheses, but not composite cybersickness, opposing hypotheses. This pattern of results mirrors that of expectancy and be similarly attributable to anxiety being elicited surrounding the modelled symptoms only, and not generalising to other symptoms, though we did not test this. Nevertheless, the current results implicate anxiety as a mechanism involved in OL of nocebo side effects.

Attribute Framing

Effect on VR-Induced Cybersickness and Nausea

Contrary to hypotheses, the current study failed to find an effect of framing on VR-induced cybersickness or nausea. Receiving any warning, whether positively or negatively

framed, did not increase side effect occurrence relative to no warning. Additionally, positive framing failed to reduce side effects relative to negative framing. There was a trend towards a significant framing effect, in the opposite direction than expected, such that VR-induced nausea seemed more pronounced following no warning compared to positively and negatively framed warnings, on average, though this did not reach statistical significance. It should be noted that emerging evidence of framing effects is mixed. As mentioned, when warnings feature low absolute risk, framing effects seem to reliably emerge where receiving any warning increases nocebo side effects relative to no warning (Faasse, Helfer, et al., 2019; Mao et al., in press) while positive framing seems to reduce nocebo side effects relative to negative framing (Faasse, Huynh, et al., 2019; Mao et al., in press; O'Connor et al., 1996). However, this pattern of results was not replicated in the current study. The failure of framing to influence cybersickness directly, or through an interaction with OL, suggests framing effects may be weaker than initially thought (Barnes, Faasse, et al., 2019).

If framing effects do genuinely exist, differences in the current study compared to others may have obstructed the effect. Despite presenting the warnings in three different modalities – verbal, written and in the VR video – the overall recall accuracy in the current study was 52%, in stark contrast to 88% reported by Mao et al. (in press), 86% by Clarke (2019), and 93% by Caplandies et al. (2017). Poor recall suggests the procedure may have imposed high cognitive load. A body of literature suggests various elements involved in performing a task, including task instructions and demands, impose load on individuals' cognitive systems (Anmarkrud et al., 2019; Paas et al., 2003; Sweller, 1988; Sweller et al., 2011). High cognitive load is proposed to interfere with task information entering memory, thereby impacting learning (Chandler & Sweller, 1992). While not assessed in the current study, high cognitive load may have been imposed by the procedure which involved participants reading information on screen, listening to instructions, using VR headsets, and

dealing with group dynamics. This may have affected participants' ability to remember warnings, which in turn could have severely undermined any potential effect of the warnings on participants' cybersickness. The implications of this will be discussed.

Mechanisms of Attribute Framing Effects

Expectancy. Participants' expectancies did not differ according to the warning they received. While opposing hypotheses, this finding aligns with previous studies that have also failed to find effects of framing on expectancies (Clarke, 2019; Devlin et al., 2019; Faasse, Huynh, et al., 2019; Mao et al., in press). O'Connor et al. (1996) and Webster and Rubin (2020) found expectancies were lower following positively framed side effect warnings compared to negative framing, inconsistent with the current study.

Of merit, expectancy was assessed prospectively in the current study, before and after the framing manipulation. This allows insight into the influences on reported expectancies, specifically, the influence of the framing manipulation. Previous framing studies have been limited by only assessing expectancy once, after the warning manipulation (e.g. Clarke, 2019; Devlin et al., 2019; Faasse, Huynh et al., 2019; Mao et al., in press; O'Connor et al, 1996; Webster & Rubin, 2020). The current study addresses this limitation with an astute method of expectancy assessment, and the results from which suggest that if framing effects do genuinely exist, expectancy may not be an underlying mechanism.

Anxiety. Opposing hypotheses, participants' anxiety did not differ depending on the warning they received. Previous studies have also failed to find differences in anxiety between framing conditions (Mao et al., in press; Webster et al., 2018). This was postulated by Barnes, Faasse, et al. (2019) to be a product of insensitive single-item anxiety assessments employed by the aforementioned studies. However, the current study used the STAI-6, a validated and sensitive measure of anxiety (Marteau & Bekker, 1992), yet still failed to find an effect. Clarke (2019) also used this measure, yet found anxiety was greatest following no

warning, relative to positive and negative framing. Together, these findings do not clarify the mechanistic role of anxiety in framing effects, but rather, beg further investigation.

Summary. Framing did not affect anxiety or expectancy, two candidate mechanisms thought to underly the effects of framing on nocebo side effects. It is possible that poor recall of cybersickness warnings also undermined these effects. The ubiquitous lack of framing effects mean that framing between-group patterns of anxiety and expectancy matched that of subsequent cybersickness and nausea, though this absence of effects means the current findings do not offer opposition or support for anxiety (Barnes, Faasse, et al., 2019) or expectancy (Glare et al., 2018) as mechanisms of framing effects on nocebo side effects.

Interaction Between Observational Learning and Attribute Framing Effects

VR-Induced Cybersickness and Nausea

The key research question was whether positive framing can reduce OL-induced nocebo side effects. Unfortunately, the lack of interaction between OL and framing effects suggest it cannot. However, this should not be taken conclusively. The absence of framing effects in the current study obfuscates the potential of positive framing to attenuate OL effects, which leaves open the possibility that positive framing can reduce OL induced side effects when framing effects are present. Nevertheless, if there are situations where positive framing does reduce side effects, it is not clear from the current study if this extends to side effects induced by OL. Directions for future research will be discussed.

Expectancy

The effect of OL on expectancy differed depending on whether side effect warnings were positively or negatively framed. Specifically, the difference in expectancy between OL and no OL was more pronounced for positive framing compared to negative framing. This may attributable to the combination of statistical information in the negative warning and potential group effects. Participants in the OL/negative framing group were informed that 3

out of 10 people experience cybersickness symptoms. These participants then observed the confederate model those warned symptoms. Therefore, participants' expectancy that they too would experience symptoms may have been reduced. Moreover, expectancy was greater following OL relative to no OL for no warning and positive framing groups but not for negative framing, suggesting something specific to negative framing – potentially the statistical information – impacted this effect. While previous studies have found negative framing increases expectancy when conducting research on individuals alone (O'Connor et al., 1996; Webster & Rubin, 2020), the current results suggest this effect may differ in group settings, though we did not assess this. Future studies should investigate whether framing effects differ between individual and group settings.

Anxiety

The effect of OL on anxiety did not differ according to framing groups. This suggests the anxiety inducing effects of OL are not sensitive to framing information. However, given framing effects were not evidenced in the current study, the possibility that anxiety may be affected by framing information when framing effects are present remains open.

Predictors and Mediators of VR-Induced Cybersickness and Nausea

Expectancy

Expectancy predicted VR-induced cybersickness and nausea, in line with hypotheses and implicating expectancy as a mechanism underlying these effects. Notably, expectancy completely mediated the effect of OL on VR-induced nausea. This evidence points towards expectancy exerting causal influence on nocebo nausea, and bolsters findings in the wider nocebo literature supporting expectancy as a robust predictor of side effects (Webster et al., 2016). For example, Koban and Wager (2016) also found expectancy strongly predicted pain ratings and completely mediated the relationship between OL and nocebo hyperalgesia. Vögtle et al. (2019), contrarily, failed to find a relationship between expectancy induced by

OL and nocebo responding, though expectancy assessments were conducted retrospectively, which relies on recall that is vulnerable to interference from actual events in the study, and as such, is not reliable (Wixted, 2004). Ultimately, the current result gives weight to the contention that OL triggers nocebo effects, which are mediated by expectancy (Blasini et al., 2017; Colloca & Miller, 2011; Faasse, 2019).

Anxiety

Anxiety predicted VR-induced cybersickness and nausea, supporting hypotheses and implicating anxiety as a mechanism of cybersickness and nausea, generally. Anxiety did not, however, mediate the effect of OL on nausea, suggesting it does not exert causal influence upon VR-induced nausea. Nonetheless, the current result is consistent with Clarke (2019) who also found anxiety predicted VR-induced nausea.

Theoretical and Practical Implications

Several important theoretical and practical implications arise from the current findings. First, this study uniquely demonstrates OL induced nocebo nausea through an online environment. This finding has implications in the current vast technological landscape which creates numerous opportunities for exposure to other's negative experiences online, which – as current findings elucidate – can induce expectancies that contribute to nocebo effects. The broadcasting of negative information on online platforms, such as social media and news outlets, should therefore be regulated to avoid unnecessary harm arising via the nocebo effect.

Second, expectancies and anxiety are central to the current understanding of how nocebo side effects arise, yet the origins of this anxiety and expectancy are scantly investigated. The current findings reveal that anxiety and expectancies are elicited by OL. Moreover, expectancy was implicated as playing a causal role in VR-induced nausea, though this evidence was not found for anxiety. In light of these findings, expectancies should be

recognised and specifically assessed prior to commencing a treatment or procedure, such as VR. If expectancies of adverse outcomes are revealed, these should then be addressed to attenuate nocebo side effect development. Potential methods for doing so will be discussed.

Third, expectancy and anxiety were found to be predictive of VR-induced cybersickness. VR has great utility in creating controlled, realistic scenarios which may otherwise be inaccessible, and is already being utilised in many industries, as mentioned. Yet, cybersickness hinders its widespread implementation. The current findings reveal anxiety and expectancy as contributing to cybersickness, elucidating psychological processes underlying these obstructive side effects.

Finally, the lack of framing effects in the current study calls their genuine existence into question. The current study used a community sample and was conducted in an open environment which grants the results greater representativeness relative to previous framing studies which have researched university student samples in closed laboratory environments (e.g Clarke, 2019; Faasse, Helfer, et al., 2019; Mao et al., in press; Webster et al., 2018). The current absence of framing effects casts doubt over their generalisability to open settings involving the general public, specifically clinical settings where the findings of framing research are often sought to be implemented.

Limitations

The methodology of the study was considered carefully, however limitations are still present. First, poor recall of cybersickness warnings may have undermined any effect the warnings could have exerted on participants' cybersickness and underlying mechanisms. High cognitive load potentially imposed by the procedure may have caused this, as discussed above. Yet, it must be considered that people often receive side effect information in high cognitive load situations, such as a medical diagnosis. Therefore, future studies should assess cognitive load and investigate if framing effects translate to these intense situations.

Second, unforeseen and uncontrollable limitations arose from the VR technology. A strength of the current study was that cybersickness warnings were given in three modalities: verbal and written (as in previous framing studies) and embedded at the beginning of the target VR video. However, due to manufacturing issues with the VR headsets, the warning in the video was missed by some participants, compromising a temporally crucial opportunity for the framing manipulation to exert influence. Therefore, limitations arose due to the VR technology despite multimodal presentation of warnings being a strength of the study.

Third, limitations arose since all participants were ethically required to receive a cybersickness warning. This inevitable part of the design meant that, while the 'no warning' condition received the most minimal warning feasible and did not receive a warning during the session, there was no 'true' no warning condition. This additionally meant that OL groups received OL *and* framing. Conclusions regarding the sole effects of OL, and genuine nocebo effects due to warning, are therefore hampered. Where possible, future research should include a group in which participants receive absolutely no warning of side effects to elucidate genuine nocebo effects due to warning, and the sole influence of OL.

Finally, the study was, by necessity, conducted single blind. While the experimenter and confederate were cautious to perform consistently across all sessions, it remains possible that experimenter and confederate bias impacted results through differentially influencing participants in different groups. It was not feasible for the current study to be conducted double blind, however future studies should consider this approach to minimise the effects of bias and improve the validity of results.

Future Directions

Where possible, future studies should address the aforementioned methodological limitations. Additionally, the current findings elucidate areas for future investigation. First, the current study demonstrated that nocebo cybersickness (nausea) is greater following

observation of symptoms relative to no observation of symptoms. However, future studies should also include an experimental group which observes the confederate model no side effects as in Faasse et al. (2015) and Faasse et al. (2018). This would elucidate potential differences between this group and a group who did not observe side effect modelling, and how framing effects may differ across such groups.

Second, future studies should try to improve recall of warnings. This could be done by making the warning more salient, perhaps by reading the warning aloud again to participants before they commence the target task. Caution should be exercised though to avoid arousing suspicion of the experiment's true purpose. Additionally, while the current study was necessary complex due to remote testing requirements, recall of warnings may be improved in future studies by utilising a simpler procedure. Though as aforementioned, whether framing effects translate to potentially high cognitive load situations should also be investigated.

Third, the current findings arose from a representative sample yet their generalisability to clinical settings may still be limited. The current study examined a community sample, which closely represents the wider population and improves on previous research into framing and OL effects which has primarily examined healthy, young samples (eg Clarke, 2019; Faasse et al., 2018; Faasse, Helfer, et al., 2019; Mao et al., in press; Vögtle et al., 2013; Vögtle et al., 2016; Vögtle et al., 2019). However, research into framing and OL effects on nocebo side effects remains to be conducted with clinical samples. This is important since factors specific to a clinical sample may differentially affect framing and OL effects in ways not elucidated in research with healthy participants. Specifically, an individual's experiences in clinical settings with doctors or other patients, or potentially comorbid conditions, may enhance or inhibit the effects of OL and framing, and any

interaction between them, on nocebo side effects. Future research is therefore necessary to investigate OL and framing effects upon nocebo side effects in clinical populations.

Finally, investigation into inhibition of nocebo side effects induced via OL is necessary given the pervasiveness of OL and the detrimental impacts it can trigger. Future studies should clarify whether positive framing is capable of attenuating OL of nocebo side effects when framing effects are present. Other methods of attenuation should also be investigated. In light of current evidence which points towards expectancy exerting causal influence in OL of nocebo effects, future studies should attempt to target expectancies of adverse outcomes specifically. Positive mood induction has been implicated as a potential method of reducing expectations of negative outcomes (Johnson & Tversky, 1983). Whether this is capable of reducing OL of nocebo side effects and reducing anxieties and expectancies which are predictive of VR-induced cybersickness, generally, should be investigated.

Conclusion

The primary aim of current study was to investigate whether the benefits of positive attribute framing extend to side effects induced via OL. However, there was no evidence of framing affecting OL of nocebo side effects, or any other outcome in the study. This simultaneously casts doubt over the genuine existence of framing effects and leaves open the possibility that positive framing can attenuate OL of nocebo effects when framing effects are present. Future studies should clarify these imperatives and investigate other methods of attenuating OL-induced side effects. Such methods should prioritise targeting expectancy given the current finding that expectancy mediates the effect of OL on nocebo nausea. This study demonstrates OL-induced nocebo side effects in an online environment for the first time and implicates anxiety and expectancy as mechanisms of these effects. To avoid unnecessary harm arising via the nocebo effect within the current vast technological landscape, media and online platforms should be closely regulated to prevent exposure to

other's negative experiences. Overall, the current study elucidates the poorly understood psychological processes by which nocebo effects arise and paves the way for future research into mitigation of these burdensome effects.

References

Anmarkrud, Ø., Andresen, A., & Bråten, I. (2019). Cognitive Load and Working Memory in Multimedia Learning: Conceptual and Measurement Issues. *Educational Psychologist, 54*(2), 61-83. https://doi.org/10.1080/00461520.2018.1554484

Bąbel, P., Bajcar, E. A., Adamczyk, W., Kicman, P., Lisińska, N., Świder, K., & Colloca, L. (2017). Classical conditioning without verbal suggestions elicits placebo analgesia and nocebo hyperalgesia. *PLOS ONE, 12*(7), e0181856. https://doi.org/10.1371/journal.pone.0181856

Bajcar, E. A., & Bąbel, P. (2018). How Does Observational Learning Produce Placebo Effects? A Model Integrating Research Findings [Review]. *Frontiers in Psychology, 9*(2041). https://doi.org/10.3389/fpsyg.2018.02041

Bandura, A. (1977). *Social learning theory*. Prentice Hall.

Barnes, K., Faasse, K., Geers, A. L., Helfer, S. G., Sharpe, L., Colloca, L., & Colagiuri, B. (2019). Can Positive Framing Reduce Nocebo Side Effects? Current Evidence and Recommendation for Future Research. *Frontiers in Pharmacology, 10*, 167. https://doi.org/10.3389/fphar.2019.00167

Barnes, K., Yu, A., Josupeit, J., & Colagiuri, B. (2019). Deceptive but not open label placebos attenuate motion-induced nausea. *Journal of Psychosomatic Research, 125*, 109808. https://doi.org/10.1016/j.jpsychores.2019.109808

Barsky, A. J., Saintfort, R., Rogers, M. P., & Borus, J. F. (2002). Nonspecific Medication Side Effects and the Nocebo Phenomenon. *JAMA : the journal of the American Medical Association, 287*(5), 622-627. https://doi.org/10.1001/jama.287.5.622

Bartels, D. J., van Laarhoven, A. I., Haverkamp, E. A., Wilder-Smith, O. H., Donders, A. R., van Middendorp, H., van de Kerkhof, P. C., & Evers, A. W. (2014). Role of conditioning and verbal suggestion in placebo and nocebo effects on itch. *PLOS ONE, 9*(3), e91727. https://doi.org/10.1371/journal.pone.0091727

Benedetti, F. (2013). Responding to nocebos through observation: Social contagion of negative emotions. *Pain, 154*(8), 1165-1165. https://doi.org/10.1016/j.pain.2013.05.012

Benedetti, F., Amanzio, M., Vighetti, S., & Asteggiano, G. (2006). The Biochemical and Neuroendocrine Bases of the Hyperalgesic Nocebo Effect. *The Journal of Neuroscience, 26*(46), 12014-12022. https://doi.org/10.1523/JNEUROSCI.2947-06.2006

Blasini, M., Corsi, N., Klinger, R., & Colloca, L. (2017). Nocebo and pain: An overview of the psychoneurobiological mechanisms. *Pain reports, 2*(2), e585. https://doi.org/10.1097/PR9.0000000000000585

Caplandies, F. C., Colagiuri, B., Helfer, S. G., & Geers, A. L. (2017). Effect type but not attribute framing alters nocebo headaches in an experimental paradigm. *Psychology of Consciousness: Theory Research, and Practice, 4*(3), 259-273. https://doi.org/10.1037/cns0000130

Chandler, P., & Sweller, J. (1992). THE SPLIT-ATTENTION EFFECT AS A FACTOR IN THE DESIGN OF INSTRUCTION. *British Journal of Educational Psychology, 62*(2), 233-246. https://doi.org/10.1111/j.2044-8279.1992.tb01017.x

Clarke, B. (2019). *Side Effects May Depend on the Framing of a Warning: But Does this Framing Effect Depend on Absolute Risk?* (Unpublished honours thesis) University of Sydney, Australia.

Colagiuri, B., McGuinness, K., Boakes, R. A., & Butow, P. N. (2012). Warning about side effects can increase their occurrence: an experimental model using placebo treatment for sleep difficulty. *Journal of Psychopharmacology, 26*(12), 1540-1547. https://doi.org/10.1177/0269881112458730

Colagiuri, B., & Quinn, V. F. (2018). Autonomic Arousal as a Mechanism of the Persistence of Nocebo Hyperalgesia. *Journal of Pain, 19*(5), 476-486. https://doi.org/10.1016/j.jpain.2017.12.006

Colagiuri, B., Schenk, L. A., Kessler, M. D., Dorsey, S. G., & Colloca, L. (2015). The placebo effect: From concepts to genes. *Neuroscience, 307,* 171-190. https://doi.org/10.1016/j.neuroscience.2015.08.017

Colagiuri, B., & Zachariae, R. (2010). Patient Expectancy and Post-chemotherapy Nausea: A Meta-analysis. *Annals of Behavioral Medicine, 40*(1), 3-14. https://doi.org/10.1007/s12160-010-9186-4

Collins, R., Reith, C., Emberson, J., Armitage, J., Baigent, C., Blackwell, L., Blumenthal, R., Danesh, J., Smith, G. D., DeMets, D., Evans, S., Law, M., MacMahon, S., Martin, S., Neal, B., Poulter, N., Preiss, D., Ridker, P., Roberts, I., Rodgers, A., Sandercock, P., Schulz, K., Sever, P., Simes, J., Smeeth, L., Wald, N., Yusuf, S., & Peto, R. (2016). Interpretation of the evidence for the efficacy and safety of statin therapy. *The Lancet, 388*(10059), 2532-2561. https://doi.org/10.1016/S0140-6736(16)31357-5

Colloca, D. L., Petrovic, D. P., Wager, D. T., Ingvar, D. M., & Benedetti, D. F. (2010). How the number of learning trials affects placebo and nocebo responses. *Pain, 151*(2), 430-439. https://doi.org/10.1016/j.pain.2010.08.007

Colloca, L., & Benedetti, F. (2009). Placebo analgesia induced by social observational learning. *Pain, 144*(1-2), 28-34. https://doi.org/10.1016/j.pain.2009.01.033

Colloca, L., & Miller, F. G. (2011). How placebo responses are formed: a learning perspective. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 366*(1572), 1859-1869. https://doi.org/10.1098/rstb.2010.0398

Corsi, N., & Colloca, L. (2017). Placebo and nocebo effects: the advantage of measuring expectations and psychological factors. *Frontiers in Psychology, 8*, 308.

Crichton, F., Dodd, G., Schmid, G., Gamble, G., Cundy, T., & Petrie, K. J. (2014). The power of positive and negative expectations to influence reported symptoms and mood during exposure to wind farm sound. *Health Psychology, 33*(12), 1588-1592. https://doi.org/10.1037/hea0000037

Danker-Hopfe, H., Dorn, H., Bornkessel, C., & Sauter, C. (2010). Do mobile phone base stations affect sleep of residents? Results from an experimental double-blind sham-controlled field study. *American Journal of Human Biology, 22*(5), 613-618. https://doi.org/10.1002/ajhb.21053

De Peuter, S., Put, C., Lemaigre, V., Demedts, M., Verleden, G., & Bergh, O. V. D. (2007). Context-evoked overperception in asthma. *Psychology & Health, 22*(6), 737-748. https://doi.org/10.1080/14768320601151702

Devlin, E. J., Whitford, H. S., & Denson, L. A. (2019). The impact of valence framing on response expectancies of side effects and subsequent experiences: a randomised controlled trial. *Psychology & Health, 34*(11), 1358-1377. https://doi.org/10.1080/08870446.2019.1609677

Faasse, K. (2019). Nocebo effects in health psychology. *Australian Psychologist, 54*(6), 453-465. https://doi.org/10.1111/ap.12392

Faasse, K., Cundy, T., & Petrie, K. (2009). Medicine and the Media. Thyroxine: anatomy of a health scare. *BMJ,, 339*, 339:b5613. https://doi.org/10.1136/bmj.b5613

Faasse, K., Gamble, G., Cundy, T., & Petrie, K. J. (2012). Impact of television coverage on the number and type of symptoms reported during a health scare: a retrospective pre–post observational study. *BMJ Open, 2*(4), e001607. https://doi.org/10.1136/bmjopen-2012-001607

Faasse, K., Grey, A., Jordan, R., Garland, S., & Petrie, K. (2015). Seeing Is Believing: Impact of Social Modeling on Placebo and Nocebo Responding. *Health Psychology, 34*(8), 880-885. https://doi.org/10.1037/hea0000199

Faasse, K., Helfer, S. G., Barnes, K., Colagiuri, B., & Geers, A. L. (2019). Experimental Assessment of Nocebo Effects and Nocebo Side Effects: Definitions, Study Design, and Implications for Psychiatry and Beyond. *Frontiers in Psychiatry, 10*(396). https://doi.org/10.3389/fpsyt.2019.00396

Faasse, K., Huynh, A., Pearson, S., Geers, A. L., Helfer, S. G., & Colagiuri, B. (2019). The Influence of Side Effect Information Framing on Nocebo Effects. *Annals of Behavioral Medicine, 53*(7), 621-629. https://doi.org/10.1093/abm/kay071

Faasse, K., Yeom, B., Parkes, B., Kearney, J., & Petrie, K. J. (2018). The Influence of Social Modeling, Gender, and Empathy on Treatment Side Effects. *Annals of Behavioral Medicine, 52*(7), 560-570. https://doi.org/10.1093/abm/kax025

Fillmore, M., & Vogel-Sprott, M. (1992). Expected effect of caffeine on motor performance predicts the type of response to placebo. *Psychopharmacology, 106*(2), 209-214. https://doi.org/10.1007/BF02801974

Ganga, H. V., Slim, H. B., & Thompson, P. D. (2014). A systematic review of statin-induced muscle problems in clinical trials. *The American heart journal, 168*(1), 6-15. https://doi.org/10.1016/j.ahj.2014.03.019

Glare, P., Fridman, I., & Ashton-James, C. E. (2018). Chapter Seven - Choose Your Words Wisely: The Impact of Message Framing on Patients' Responses to Treatment Advice.

In L. Colloca (Ed.), *International Review of Neurobiology* (Vol. 139, pp. 159-190). Academic Press. https://doi.org/https://doi.org/10.1016/bs.irn.2018.07.020

Gupta, A., Thompson, D., Whitehouse, A., Collier, T., Dahlof, B., Poulter, N., Collins, R., & Sever, P. (2017). Adverse events associated with unblinded, but not with blinded, statin therapy in the Anglo-Scandinavian Cardiac Outcomes Trial-Lipid-Lowering Arm (ASCOT-LLA): a randomised double-blind placebo-controlled trial and its non-randomised non-blind extension phase. *Lancet, 389*(10088), 2473-2481. https://doi.org/10.1016/s0140-6736(17)31075-9

Johnson, E. J., & Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology, 45*(1), 20-31. https://doi.org/10.1037/0022-3514.45.1.20

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica, 47*(2), 263-291. https://doi.org/10.2307/1914185

Kennedy, R. S., Lane, N. E., Berbaum, K. S., & Lilienthal, M. G. (1993). Simulator Sickness Questionnaire: An Enhanced Method for Quantifying Simulator Sickness. *The International Journal of Aviation Psychology, 3*(3), 203-220. https://doi.org/10.1207/s15327108ijap0303_3

Kessner, S., Wiech, K., Forkmann, K., Ploner, M., & Bingel, U. (2013). The Effect of Treatment History on Therapeutic Outcome: An Experimental Approach. *JAMA Internal Medicine, 173*(15), 1468-1469. https://doi.org/10.1001/jamainternmed.2013.6705

Kirsch, I. (1985). Response Expectancy as a Determinant of Experience and Behavior. *American Psychologist, 40*(11), 1189-1202. https://doi.org/10.1037/0003-066X.40.11.1189

Kirsch, I. (2001). The Response Set Theory of Hypnosis: Expectancy and Physiology. *American Journal of Clinical Hypnosis, 44*(1), 69-73. https://doi.org/10.1080/00029157.2001.10403458

Kirsch, I. (2018). *Response Expectancy and the Placebo Effect* (Vol. 138). Academic Press Inc. https://doi.org/10.1016/bs.irn.2018.01.003

Klosterhalfen, S., Kellermann, S., Braun, S., Kowalski, A., Schrauth, M., Zipfel, S., & Enck, P. (2009). Gender and the nocebo response following conditioning and expectancy. *Journal of Psychosomatic Research, 66*(4), 323-328. https://doi.org/https://doi.org/10.1016/j.jpsychores.2008.09.019

Koban, L., & Wager, T. D. (2016). Beyond conformity: Social influences on pain reports and physiology. *Emotion 16*(1), 24-32. https://doi.org/10.1037/emo0000087

Köteles, F., & Babulka, P. (2014). Role of expectations and pleasantness of essential oils in their acute effects. *Acta Physiologica Hungarica, 101*(3), 329-340. https://doi.org/10.1556/APhysiol.101.2014.3.8

Laver, K. E., Lange, B., George, S., Deutsch, J. E., Saposnik, G., & Crotty, M. (2017). Virtual reality for stroke rehabilitation. *Cochrane Database of Systematic Reviews*(11), CD008349. https://doi.org/10.1002/14651858.CD008349.pub4

Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All Frames Are Not Created Equal: A Typology and Critical Analysis of Framing Effects. *Organizational Behavior and Human Decision Processes, 76*(2), 149-188. https://doi.org/https://doi.org/10.1006/obhd.1998.2804

Link, J., Haggard, R., Kelly, K., & Forrer, D. (2006). Placebo/Nocebo Symptom Reporting in a Sham Herbal Supplement Trial. *Evaluation & the Health Professions, 29*(4), 394-406. https://doi.org/10.1177/0163278706293403

Lorber, W., Mazzoni, G., & Kirsch, I. (2007). Illness by suggestion: Expectancy, modeling, and gender in the production of psychosomatic symptoms. *Annals of Behavioral Medicine, 33*(1), 112-116. https://doi.org/10.1207/s15324796abm3301_13

Mahr, A., Golmard, C., Pham, E., Iordache, L., Deville, L., & Faure, P. (2017). Types, frequencies, and burden of nonspecific adverse events of drugs: analysis of randomized placebo-controlled clinical trials. *Pharmacoepidemiology and drug safety, 26*(7), 731-741. https://doi.org/10.1002/pds.4169

Mao, A., Barnes, K., Sharpe, L., Geers, A., Helfer, S., Faasse, K., & Colagiuri, B. (in press). Using positive attribute framing to attenuate nocebo side effects: a virtual reality study. *Annals of Behavioural Medicine*.

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State—Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology, 31*(3), 301-306. https://doi.org/10.1111/j.2044-8260.1992.tb00997.x

Mills, L., Boakes, R. A., & Colagiuri, B. (2018). The effect of dose expectancies on caffeine withdrawal symptoms during tapered dose reduction. *Journal of Psychopharmacology, 33*(8), 994-1002. https://doi.org/10.1177/0269881118817158

Min, B.-C., Chung, S.-C., Min, Y.-K., & Sakamoto, K. (2004). Psychophysiological evaluation of simulator sickness evoked by a graphic simulator. *Applied Ergonomics, 35*(6), 549-556. https://doi.org/https://doi.org/10.1016/j.apergo.2004.06.002

Mondaini, N., Gontero, P., Giubilei, G., Lombardi, G., Cai, T., Gavazzi, A., & Bartoletti, R. (2007). Finasteride 5mg and Sexual Side Effects: How Many of these are Related to a Nocebo Phenomenon? *The Journal of Sexual Medicine, 4*(6), 1708-1712. https://doi.org/10.1111/j.1743-6109.2007.00563.x

Moss, J. D., & Muth, E. R. (2011). Characteristics of Head-Mounted Displays and Their Effects on Simulator Sickness. *Human Factors, 53*(3), 308-319. https://doi.org/10.1177/0018720811405196

Munafo, J., Diedrick, M., & Stoffregen, T. (2017). The virtual reality head-mounted display Oculus Rift induces motion sickness and is sexist in its effects. *Experimental Brain Research, 235*(3), 889-901. https://doi.org/10.1007/s00221-016-4846-7

Myers, E., & Calvert, E. (1984). Information, compliance and side-effects: a study of patients on antidepressant medication. *British Journal of Clinical Pharmacology, 17*(1), 21-25. https://doi.org/10.1111/j.1365-2125.1984.tb04993.x

Myers, M. G., Cairns, J. A., & Singer, J. (1987). The consent form as a possible cause of side effects. *Clinical Pharmacology & Therapeutics, 42*(3), 250-253. https://doi.org/10.1038/clpt.1987.142

Neukirch, N., & Colagiuri, B. (2015). The placebo effect, sleep difficulty, and side effects: a balanced placebo model. *Journal of Behavioral Medicine, 38*(2), 273-283. https://doi.org/10.1007/s10865-014-9590-5

Nevelsteen, S., Legros, J.-J., & Crasson, M. (2007). Effects of information and 50 Hz magnetic fields on cognitive performance and reported symptoms. *Bioelectromagnetics, 28*(1), 53-63. https://doi.org/10.1002/bem.20265

O'Connor, A. M., Pennie, R. A., & Dales, R. E. (1996). Framing effects on expectations, decisions, and side effects experienced: The case of influenza immunization. *Journal of Clinical Epidemiology, 49*(11), 1271-1276. https://doi.org/https://doi.org/10.1016/S0895-4356(96)00177-1

Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive Load Theory and Instructional Design: Recent Developments. *Educational Psychologist, 38*(1), 1-4. https://doi.org/10.1207/S15326985EP3801_1

Quinn, V. F., MacDougall, H. G., & Colagiuri, B. (2015). Galvanic Vestibular Stimulation: a new model of placebo-induced nausea. *Journal of Psychosomatic Research, 78*(5), 484-488. https://doi.org/10.1016/j.jpsychores.2014.12.011

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education, 147*, 103778. https://doi.org/https://doi.org/10.1016/j.compedu.2019.103778

Rebenitsch, L., & Owen, C. (2016). Review on cybersickness in applications and visual displays. *Virtual Reality, 20*(2), 101-125. https://doi.org/10.1007/s10055-016-0285-9

Samadbeik, M., Yaaghobi, D., Bastani, P., Abhari, S., Rezaee, R., & Garavand, A. (2018). The Applications of Virtual Reality Technology in Medical Groups Teaching. *Journal of advances in medical education & professionalism, 6*(3), 123-129. https://pubmed.ncbi.nlm.nih.gov/30013996

Schmid, J., Bingel, U., Ritter, C., Benson, S., Schedlowski, M., Gramsch, C., Forsting, M., & Elsenbruch, S. (2015). Neural underpinnings of nocebo hyperalgesia in visceral pain: a fMRI study in healthy volunteers. *Neuroimage, 120*, 114-122.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285. https://doi.org/https://doi.org/10.1016/0364-0213(88)90023-7

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive Load Theory*. Springer New York. http://ebookcentral.proquest.com/lib/usyd/detail.action?docID=763221

Świder, K., & Bąbel, P. (2013). The effect of the sex of a model on nocebo hyperalgesia induced by social observational learning. *Pain, 154*(8), 1312-1317. https://doi.org/https://doi.org/10.1016/j.pain.2013.04.001

Tan, K., Petrie, K. J., Faasse, K., Bolland, M. J., & Grey, A. (2014, 2014). Unhelpful information about adverse drug reactions. *British Medical Journal (Online), 349:g5019*. https://doi.org/http://dx.doi.org/10.1136/bmj.g5019

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*(4481), 453-458. https://doi.org/10.1126/science.7455683

Valmaggia, L. R., Latif, L., Kempton, M. J., & Rus-Calafell, M. (2016). Virtual reality in the psychological treatment for mental health problems: An systematic review of recent evidence. *Psychiatry research, 236,* 189-195. https://doi.org/10.1016/j.psychres.2016.01.015

Van Laarhoven, I. M. A., Vogelaar, L. M., Wilder-Smith, H. O., Van Riel, L. C. M. P., Van De Kerkhof, C. M. P., Kraaimaat, W. F., & Evers, W. M. A. (2011). Induction of nocebo and placebo effects on itch and pain by verbal suggestions. *Pain, 152*(7), 1486-1494. https://doi.org/10.1016/j.pain.2011.01.043

Vase, J. L., Baram, S. S., Takakura, S. N., Yajima, S. H., Takayama, S. M., Kaptchuk, S. T., Schou, S. S., Jensen, S. T., Zachariae, S. R., & Svensson, S. P. (2013). Specifying the nonspecific components of acupuncture analgesia. *Pain, 154*(9), 1659-1667. https://doi.org/10.1016/j.pain.2013.05.008

Vögtle, E., Barke, A., & Kroner-Herwig, B. (2013). Nocebo hyperalgesia induced by social observational learning. *Pain, 154*(8), 1427-1433. https://doi.org/10.1016/j.pain.2013.04.041

Vögtle, E., Herwig, B. K., & Barke, A. (2016). Nocebo hyperalgesia: contributions of social observation and body-related cognitive styles. *Journal of Pain Research, 9*(1), 241-249. https://doi.org/10.2147/JPR.S96228

Vögtle, E., Kröner-Herwig, B., & Barke, A. (2019). Nocebo Hyperalgesia can be Induced by the Observation of a Model Showing Natural Pain Expressions. *The Clinical journal of pain, 35*(9), 737-743. https://doi.org/10.1097/AJP.0000000000000734

Webster, R. K., & Rubin, G. J. (2020). The Effect of Positively Framing Side-Effect Risk in Two Different Formats on Side-Effect Expectations, Informed Consent and Credibility: A Randomised Trial of 16- to 75-Year-Olds in England. *Drug safety, 43*(10), 1011-1022. https://doi.org/10.1007/s40264-020-00959-8

Webster, R. K., Weinman, J., & Rubin, G. J. (2016). A systematic review of factors that contribute to nocebo effects. *Health Psychology, 35*(12), 1334.

Webster, R. K., Weinman, J., & Rubin, G. J. (2018). Positively Framed Risk Information in Patient Information Leaflets Reduces Side Effect Reporting: A Double-Blind Randomized Controlled Trial. *Annals of Behavioral Medicine, 52*(11), 920-929. https://doi.org/10.1093/abm/kax064

Wixted, J. T. (2004). The Psychology and Neuroscience of Forgetting. *Annual Review of Psychology, 55*(1), 235-269. https://doi.org/10.1146/annurev.psych.55.090902.141555

Woo, K. Y. (2015). Unravelling nocebo effect: the mediating effect of anxiety between anticipation and pain at wound dressing change. *Journal of Clinical Nursing, 24*(13-14), 1975-1984. https://doi.org/10.1111/jocn.12858

Zunhammer, M., Ploner, M., Engelbrecht, C., Bock, J., Kessner, S. S., & Bingel, U. (2017). The effects of treatment failure generalize across different routes of drug administration. *Science Translational Medicine, 9*(393), eaal2999. https://doi.org/10.1126/scitranslmed.aal2999

Appendices

Appendix A: Ethics Approval

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Friday, 15 May 2020

[redacted]

[redacted]

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2020/198**
Project Title:	**The social transmission and inhibition of nocebo effects in nausea**
Authorised Personnel:	[redacted]
Approval Period:	**15/05/2020** to **15/05/2024**
First Annual Report Due:	**15/05/2021**

Documents Approved:

Date Uploaded	Version Number	Document Name
22/04/2020	Version 1	New: Study 1b Debrief
22/04/2020	Version 1	New: Study 1b SONA Paid Advert
22/04/2020	Version 1	Debrief_WithVR.docx - requested by committee
22/04/2020	Version 1	New: Study 1b Consent Form
22/04/2020	Version 1	New: Study 1b SONA Psych Advert
22/04/2020	Version 1	New: Study 1b General Advert
22/04/2020	Version 1	SSQ - requested by committee
22/04/2020	Version 1	New: Study 1b Participant Information Sheet
02/03/2020	Version 1	Participant Information Statement (if VR is removed - pilot)
02/03/2020	Version 1	Debrief (without VR - see pilot)
02/03/2020	Version 1	Questionnaires without VR (see pilot)
02/03/2020	Version 1	Questionnaire measures with VR
02/03/2020	Version 1	Consent form for all experiments
02/03/2020	Version 1	Participant Information Statement with VR
02/03/2020	Version 1	SONA Paid Advert (with VR)
02/03/2020	Version 1	SONA Psych Advert (without VR - see pilot)
02/03/2020	Version 1	SONA Psych Advert (with VR)
02/03/2020	Version 1	SONA Paid Advert (without VR - see pilot)

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.

Research Integrity & Ethics Administration
Research Portfolio
Level 3, F23 Administration Building
The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
W sydney.edu.au/ethics

ABN 15 211 513 464
CRICOS 00026A

Appendix B: Permission to Use YouTube Videos

Target Video

Hello [redacted]

Thank you for your email.

I would allow you to present my video but currently I am not sure how to provide you with it. [redacted]

Kind regards

[redacted]

Hello [redacted]

[redacted]

Did you try to download the video? I think YouTube doesn't provide a full resolution download version of 360 videos yet.

If you can't download it let me know and hopefully we will find a way.

[redacted]

Distractor Video

[redacted]
thanks for reaching out, apologies for the delay, [redacted]. But wanted to touchbase and see how I can help contribute to the study. Yes Im fine with that in terms of the rights for the study. Could you share some further information about the study as well. Do you need the hard file for the headsets, if so I can supply you with a download link to them. Thanks again and hope its not too late to contribute!

Thanks!

Thank you,

[redacted]
Founder
CAPTIVISION
646-262-1117
Captivision
YouTube Channel
www.captivisionmedia.com

Calibration Video (made by research team)

https://youtu.be/wqdrvz1yJ6c

Appendix C: Top ten symptoms increased by VR exposure (Mao et al., in press)

1. Nausea*
2. General discomfort*
3. Sweating*
4. Dizzy (eyes open)
5. Dizzy (eyes closed)
6. Stomach awareness
7. Vertigo
8. Blurred vision
9. Fullness of head
10. Headache

* denotes symptoms chosen as example symptoms in cybersickness warnings, and those modelled by the confederate in the current study.

Appendix D: Facebook Study Advertisement

Online VR Research Study - University of Sydney
17 June ·

Australia Wide 1hr Online Research Study (via Zoom) run by the University of Sydney.

This experiment investigates online learning in Virtual Reality (VR), specifically whether memory differs when VR is experienced in pairs or groups. Ability to recall aspects of the VR experience will be assessed and self-report measures of a non-personal nature collected. The equipment used is safe, non-invasive and does not cause discomfort.

You will receive a free VR headset, yours to keep!

Follow this link to find out if you're eligible:
https://sydney.au1.qualtrics.com/jfe/form/SV_5j7NCFKtFoxqHxX

Appendix E: General Study Advertisement

Name: How does online learning in Virtual Reality affect memory?

Brief Description: This experiment investigates online learning in Virtual Reality (VR), specifically whether memory differs when VR is experienced in pairs or groups. Ability to recall aspects of the VR experience will be assessed and self-report measures of a non-personal nature collected. The equipment used is safe, non-invasive and does not cause discomfort.

Detailed Description: This experiment investigates the effect of online learning in VR on memory, and whether memory differs when VR is experienced in pairs or groups. As a participant, you will be required to attend one sixty-minute session, conducted online via Zoom from a location of your choosing. Prior to the session you will be sent a smartphone VR headset, which you can keep after completing the study. Before the session, you can only use the headset ONCE to check it works properly. If you later decide not to attend the Zoom, you will be expected to return the VR headset in undamaged condition (postage provided). Mailing addresses used to deliver the headset will be kept in a password protected file (not attached to any other data). A mobile number will be required to send you the VR stimuli. All personal information will be destroyed once the testing session is over and will not be passed to any third party.
The Zoom session will be attended by the experimenter and four other participants. During the session you will view two VR videos. We will assess your ability to recall aspects of the two videos as well as other questions about how you felt during VR. These questions will be administered privately online so only the researchers will have access to them. Due to the VR headsets used, you may experience very mild symptoms of cybersickness (e.g. nausea, general discomfort, and sweating. This is temporary and will disappear once the headset is removed and the experiment is finished. All Zoom sessions will be recorded for data coding. However, recordings will be identified by anonymised code, will only be available to the researchers associated with the project, and will be stored in a password protected file on a University server. To maintain anonymity, you will decide how you are identified in the Zoom environment (i.e. first name, pseudonym, participant code).
We are looking for participants who do not have extensive experience with VR technology (i.e. have used VR no more than 10 times previously). Those who have used VR more than 10 times, who have a medical condition that affects postural stability or increases the risk of nausea, as well as those who are pregnant, are asked not to sign up. This includes those with epilepsy, pacemakers, and pre-existing binocular visual abnormalities (e.g. Amblyopia ‘lazy eye’, Strabismus ‘double vision’). Those who are experiencing inner ear infections and migraines at the time of signing up are also asked not to take part. Participants should not eat the hour before attending the session.

Eligibility: You must NOT have: used VR more than 10 times, be pregnant, have epilepsy, a pacemaker or pre-existing binocular visual abnormalities (e.g. Amblyopia ‘lazy eye’, Strabismus ‘double vision’). Those experiencing inner ear infections and migraines at the time of testing should not take part. Participants should not eat the hour before attending the session. You must also have a smartphone with a screen size between 4.1 and 6.1 inches (10.4cm – 15.2cm), measured diagonally from the bottom left to the top right corner (note: iPhones 6 – 8 Plus, X, and 11 fit, but Pro Max does not), and the latest version of the YouTube application installed on the device.

Duration: 60 minutes
Preparation: You must not meet any of the exclusion criteria.
Human Ethics Res Approval Code: 2020/198

Appendix F: Participant Information Statement

THE UNIVERSITY OF SYDNEY

School of Psychology
Faculty of Science

ABN 15 211 513 464

[redacted]

[redacted]

Web: http://www.sydney.edu.au/

How does online learning in Virtual Reality affect memory?

PARTICIPANT INFORMATION STATEMENT

(1) What is this study about?

You are invited to take part in a research study investigating how online learning in Virtual Reality (VR) affects memory. Of interest to us specifically is whether memory of VR experiences differs depending on whether VR experiences are engaged in and recalled in pairs or in groups. During this experiment (conducted in groups of five individuals via Zoom), you will wear the VR headset provided by the research team and will be immersed in two VR environments. During the session, we will assess your perceptual experience, your ability to recall aspects of the VR experiences, and will ask you to respond to some self-report questions of a non-personal nature (collected via Qualtrics software). Your responses to these items will be confidential and no one other than the researchers will have access to them.

You have been invited to participate because you responded to an advertisement about the study. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the research. Please read this sheet carefully and feel free to ask questions (via the email address provided in item 11 below) about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving your consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.
- ✓ Agree to the recording of the Zoom session. This recording is essential for specific parts of the task to be coded. Only the research group will have access to this data. Recordings will be identified by your anonymised participant ID and will be stored in a password protected folder on a University server. Details will never be passed to any third party.

You will receive an electronic copy of this Participant Information Statement to keep.

(2) Who is running the study?

The study is being carried out by the following researchers:

This study is being funded by the Australian Research Council.

(3) What will the study involve for me?

If you agree to participate you will be asked to:

- ✓ Attend a single 60-minute session, conducted in a location of your choosing, via Zoom
- ✓ Provide some basic demographic data, e.g. age, gender
- ✓ Complete some basic questions about your current state of well-being
- ✓ Wear a VR headset and be immersed in a virtual environment
- ✓ Respond to some questions about your VR experience

(4) How much of my time will the study take?

The study involves one 60-minute session.

(5) Who can take part in the study?

Healthy adults who do not have extensive prior experience with VR (i.e. have used VR no more than 10 times previously). Although the risk to participants is extremely low, those who have a medical condition that affects postural stability or increases the risk of nausea (including those with epilepsy, pacemakers, and pre-existing binocular visual abnormalities ((e.g. Amblyopia 'lazy eye', Strabismus 'double vision')), as well as those who are pregnant are not eligible to participate in the study. If you are experiencing an inner ear infection or migraine at the time of testing, please do not take part. For the study, you must also have a smartphone with a screen size between 4.1 and 6.1 inches (10.4cm – 15.2cm), measured diagonally from the bottom left to the top right corner (note: iPhones 6 – 8 Plus, X, and 11 fit, but Pro Max does not), and the latest version of the YouTube application installed on the device.

(6) Do I have to be in the study? Can I withdraw from the study once I've started?

Being in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of Sydney.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by informing the researcher that you wish to withdraw. There will be no negative consequences should you wish to withdraw.

(7) Are there any risks or costs associated with being in the study?

Possible risks may include, but are not limited to:

- ✓ Due to the procedure and VR headsets used, you may experience very mild symptoms of cybersickness (e.g. nausea, general discomfort, and sweating). This is temporary and will disappear once you finish the experiment.

(8) Are there any benefits associated with being in the study?

All participants will receive a VR headset via post that will be theirs to keep if they complete the study. Those who do not attend the session will be expected to return the headset in undamaged condition (postage provided). First year psychology students participating via SONA will additionally receive 1 hour of course credit.

(9) What will happen to information about me that is collected during the study?

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise.

Your information will be stored securely and your identity/information will be kept strictly confidential, except as required by law. Study findings may be published, but you will not be individually identifiable in these publications.

(10) Can I tell other people about the study?

As prior knowledge of the experimental aims and methods may alter results, it would be appreciated if you could refrain from discussing the experiment with others.

(11) What if I would like further information about the study?

When you have read this information, [redacted] will be available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage during the study, please feel free to contact [redacted] either via phone [redacted] or email [redacted] or [redacted] via email [redacted]

(12) Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the appropriate box on the Participant Consent From. This feedback will be in the form of a one-page lay summary. You will receive this feedback after the study is finished.

(13) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney [redacted] As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007).* This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the university using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

A pdf copy of this information sheet will be emailed to you to keep

Appendix G1: Information about VR – Positive Frame

Information about Virtual Reality

As you understand, we are investigating online learning in Virtual Reality, of specific interest to us is whether memory is different when engaging in online learning in groups or in pairs. The VR headsets we have provided you with create an immersive environment that simulates a realistic experience. You will need to insert your smartphone into the appropriate place in the headset for the VR experiences.

While wearing the headset, you will be able to turn your head which will simulate looking around the virtual environment. You will have two different virtual reality experiences, the total time in the headset will be 6 minutes. During the VR experiences please ensure you are seated. If you wish to stop the experiment at any time for any reason, please tell the experimenter.

Warning: the use of Virtual Reality headsets is safe however they can cause cybersickness, a type of motion sickness associated with Virtual Reality. This cybersickness can include feelings of nausea, general discomfort, and sweating.

From previous research, we typically find that 7 out of 10 people will <u>not</u> experience cybersickness to a level that bothers them. If you do experience any of these symptoms, they will pass soon after you take the headset off.

Appendix G2: Information about VR – Negative Frame

Information about Virtual Reality

As you understand, we are investigating online learning in Virtual Reality, of specific interest to us is whether memory is different when engaging in online learning in groups or in pairs. The VR headsets we have provided you with create an immersive environment that simulates a realistic experience. You will need to insert your smartphone into the appropriate place in the headset for the VR experiences.

While wearing the headset, you will be able to turn your head which will simulate looking around the virtual environment. You will have two different virtual reality experiences, the total time in the headset will be 6 minutes. During the VR experiences please ensure you are seated. If you wish to stop the experiment at any time for any reason, please tell the experimenter.

Warning: the use of Virtual Reality headsets is safe however they can cause cybersickness, a type of motion sickness associated with Virtual Reality. This cybersickness can include feelings of nausea, general discomfort, and sweating.

From previous research, we typically find that 3 out of 10 people will experience cybersickness to a level that bothers them. If you do experience any of these symptoms, they will pass soon after you take the headset off.

Appendix G3: Information about VR – No Warning

Information about Virtual Reality

As you understand, we are investigating online learning in Virtual Reality, of specific interest to us is whether memory is different when engaging in online learning in groups or in pairs. The VR headsets we have provided you with create an immersive environment that simulates a realistic experience. You will need to insert your smartphone into the appropriate place in the headset for the VR experiences.

While wearing the headset, you will be able to turn your head which will simulate looking around the virtual environment. You will have two different virtual reality experiences, the total time in the headset will be 6 minutes. During the VR experiences please ensure you are seated. If you wish to stop the experiment at any time for any reason, please tell the experimenter.

Appendix H: SSQ Composite

You will now be asked about your current experiences of a range of physical symptoms and sensations. Please think carefully about each symptom and ask the experimenter if you are unsure about the meaning of any of the words.

How much are you experiencing each of the following sensations or symptoms currently?

General discomfort

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Fatigue

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Headache

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Eye strain

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Difficulty focusing

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Salivation increasing

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Choose option 2 for this question.

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Sweating

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Nausea

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Difficulty concentrating

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Fullness of the head

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Blurred vision

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Dizziness with eyes open

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Dizziness with eyes closed

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Vertigo

** Vertigo is experienced as feeling off balance.*

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Stomach awareness

** Stomach awareness is a feeling of discomfort which is just short of nausea.*

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Burping

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

SSQ Nausea Subscale

You will now be asked about your current experiences of a range of physical symptoms and sensations. Please think carefully about each symptom and ask the experimenter if you are unsure about the meaning of any of the words.

How much are you experiencing each of the following sensations or symptoms currently?

General discomfort

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Salivation increasing

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Sweating

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Nausea

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Difficulty concentrating

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Stomach awareness

** Stomach awareness is a feeling of discomfort which is just short of nausea.*

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Burping

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Appendix I: STAI-6

A number of statements which people have used to describe themselves are given in the next few questions. Read each statement and choose the most appropriate answer below the statement to indicate **how you feel right now, at this moment.**

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

I feel calm

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

I am tense

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

I feel upset

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

I am relaxed

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

I feel content

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

I am worried

Not at all	Somewhat	Moderately	Very Much
○	○	○	○

Appendix J: Expectancy Questionnaire

Read each statement and choose the most appropriate number below the statement to indicate **how you feel right now, at this moment.**

To what extent do you expect the Virtual Reality experience to feel real?

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

How much do you expect to experience feelings of cybersickness (e.g., nausea, general discomfort, sweating) during the Virtual Reality video?

Not at all		Slightly		Moderately			Strongly		Severely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

How much do you believe immersive Virtual Reality experiences can contribute to online learning?

Not at all		Slightly		Moderately			Strongly		Extremely	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Appendix K: Manipulation and Framing Memory Check

Do you remember being warned about cybersickness being a possible side effect of using the Virtual Reality Headset?

- ◯ Yes
- ◯ No

Please fill in the information you were told about experiencing cybersickness as a side effect of Virtual Reality.

Which of the following statements were you presented with at the beginning of the video?

- ◯ From previous research, 7 out of 10 people will not experience cybersickness at a level that bothers them.
- ◯ From previous research, 3 out of 10 people will experience cybersickness at a level that bothers them.
- ◯ From previous research, a proportion of people will experience cybersickness at a level that bothers them.
- ◯ Didn't receive any of the above statements.

What do you think the purpose of this experiment was?

Appendix L: Participant Consent Form

THE UNIVERSITY OF SYDNEY

School of Psychology
Faculty of Science

ABN 15 211 513 464

[redacted]

[redacted]

Web: http://www.sydney.edu.au/

PARTICIPANT CONSENT FORM

I, ... [TYPE NAME], agree to take part in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.
- I understand that I can withdraw from the study at any time.
- I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- I understand that the Zoom session will be recorded. This is essential for specific parts of the task to be coded. Zoom meetings are encrypted for privacy and only the research group will have access to this data. Recordings will be identified via anonymised participant IDs and will be stored in a password protected folder on a University server. Details will never be passed to any third party.

I would like to receive feedback about the overall results of this study YES NO

If you answered **YES**, please enter your email into the box below:

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "agree" button below indicates that:

- **You have read the above information**
- **You voluntarily agree to participate**

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button. This will close the current Qualtrics survey and send you to the University of Sydney homepage.

O I consent to take part in the study

O I DO NOT consent to take part in the study

Appendix M: Demographics Questionnaire

Q40 Please confirm your preferred email address.

_____

Q1 What is your age?

_____

Q34 What is your gender?

- ○ Male
- ○ Female
- ○ Other

Q32 Have you experienced Virtual Reality before?

- ○ Yes
- ○ No

Q35 How many hours have you spent in Virtual Reality?

_____

Q33 In order to participate in this study, you will be sent a virtual reality head-mounted display that utilises your smartphone. Your address will be kept confidential and not seen by anyone other than the experimenters.

Please enter a shipping address.

- ○ Full Name _____
- ○ Address Line 1 _____
- ○ Address Line 2 _____
- ○ Suburb _____
- ○ State/Territory_____
- ○ Post Code _____

Q36 For the duration of the study, we may need to send information and reminders by text message.

Please enter your preferred mobile number.

- ○ Mobile Number _____

Appendix N: Social Modelling of Cybersickness Symptoms Script

Wow, this is pretty cool. Looks like we're on a pretty stock standard roller coaster.

Maybe a bit more colourful than usual, I guess.

Oh, seems like I'm the only one on it actually. Guess we're doing this alone.

Coming up to the first drop now I think. I'm pretty high up.

Woah woah woah okay that was a big drop. FAR OUT!! WOAH big loop there as well (tense up)

Jeez was not prepared for this at all. It felt like my *stomach dropped*, almost like on a real roller coaster. I never thought a virtual roller coaster could compare to the real thing.

I *feel a bit uneasy* if I'm honest (grab/rub neck as if sweating) It's getting real loopy.

I'm starting to *sweat* now. (air out shirt motion and take deep breath).

Umm, calmer bit of the ride now at least. We're going over a smallish pond or pool thing.

OK Woah, just did a complete 360 (deep breath out)

Feel a bit queasy after that (groan).

[2:00] Slowing down now. I guess this is the end of the ride.

Action: Breathe out + look unwell.

Experimenter: So, Julian, for (name of next participant) could you please describe your experience of that VR Video

Confederate: I didn't realise how realistic a virtual reality roller coaster could be. Or just a VR in general really. Umm, the environment itself seemed pretty real and immersive though.

Experimenter: And could you please tell me how you feel, physically, at the moment?

Confederate: It honestly made me *feel quite nauseous* and *uncomfortable***.** I feel a bit *hot* too.

Note. italicised words are those that correspond to general discomfort, nausea, and sweating items of the SSQ nausea subscale, or synonyms of those items.

Appendix O: Group Memory Questions

Can anyone please tell me what city the video was based in?

How many landmarks and/or attractions were in the video and what were their names?

How many different angles did you see the Eiffel Tower from?

Do you think it would have been helpful to have some commentary about Paris and the landmarks while you were watching? Or how did you find the immersive VR setting for learning, as opposed to maybe just viewing a picture of each landmark?

Appendix P: Debrief Statement

How does online learning in Virtual Reality affect memory?

DEBRIEF STATEMENT

Details of the Study

Thank you for your participation in this research. The experiment was conducted by [redacted] and [redacted] under the supervision of [redacted] and [redacted], [redacted]

Background

Nausea and vomiting are significant problems in clinical settings, for example among those receiving chemotherapy treatment [1]. This can result in an increased burden on healthcare resources and decreased quality of life for the patient [2]. Nauseous symptoms are also an issue for many individuals undergoing simulated training in the aviation and aerospace sectors, as well as the military [3, 4]. Recurrent symptoms of nausea have led some facilities to ground pilots for 6-12 hours subsequent to these sessions, reducing the individual's ability to work efficiently and potentially dissuading some from continued training [5]. Identifying potential psychological mechanisms underlying the nauseous response that could ultimately lead to interventions to reduce nausea is therefore essential. In order to achieve such a goal, we first need to understand how factors such as expectations elicited by information provided to us and what other people tell us about their symptoms impact our experience of nausea.

The present experiment therefore investigates the role of direct instructions and social modelling on symptoms of nausea experiences as a result of VR.

The Role of Social Modelling

Recent literature has identified that observing others express unpleasant side effects from medication can hinder an individual's view of the treatment's effectiveness [6]. This finding also extends to the reporting of symptoms displayed by others following exposure to a benign substance that does not otherwise cause negative outcomes [7, 8]. It is postulated that these socially learned symptoms may simply require being told by a peer that a treatment or device caused them harm.

In the current study, some participants viewed another participant experience VR before experiencing VR themselves. In some cases, the first participant was actually part of the research team and intentionally acted as if he was experiencing nausea to provide a 'social model' for the subsequent participants. Other participants did not view anyone else experience VR before

undergoing VR themselves. This allows us to test whether viewing a 'social model' reporting nausea actually increases your chances of experiencing nausea.

The Role of Direct Instructions

In order to investigate the role of direct instructions, some participants were told that '3 out of 10 people will experience side effects' (negative framing), '7 out of 10 people will NOT experience side effects' (positive framing), or were not given any additional information about side effects (no instructions). We were interested in whether positive framing reduced the experienced side effects of VR relative to negative framing, even though the statistical information provided in both conditions is equivalent.

In order to investigate the role of instruction and social learning in the present experiment, it was necessary to use a cover story to encourage you to believe that the primary outcome of the study was learning and memory. This is because knowledge of the true aims of the experiment is likely to alter your performance. We apologise for this deception and hope that you will understand why this was required. We hope that the results of the experiment will ultimately lead to research that will help us find ways of reducing nausea.

The reason for delaying this information until now is so that other potential participants did not know that the study involved the role of expectancy before they participated. We apologise for this deception and for the delay in revealing the study's true aims. After reading this you have the right to withdraw your data from the study. Please inform one of the researchers if you wish to do this. Please be assured that there will be no repercussions if you choose to do this.

If you would like to know more about this study, please contac[redacted]
or[redacted] or[redacted]

Meanwhile, because it is important that other participants do not know precisely what we are looking for before they are tested, we ask for your help by not telling other people that might participate in this study future.

References

1. Brooks, J.O., et al., *Simulator sickness during driving simulation studies*. Accident Analysis & Prevention, 2010. **42**(3): p. 688-796.
2. Webb, C.M., *Simulator sickness in the MH-47G simulator,* in *USA ARL Annual Report*. 2010-11, Fort Rucker, AL: USAARL; 2011.
3. Lucertini, M., et al., *The effect of cinnarizine and cocculus indicus on simulator sickness*. Physiology & Behavior, 2007. **91**(1): p. 180-190.

4. Colagiuri, B. and R. Zachariae, *Patient Expectancy and Post-chemotherapy Nausea: A Meta-analysis.* Annals of Behavioral Medicine, 2010. **40**(1): p. 3-14.
5. Bender, C.M., et al., *Chemotherapy-Induced Nausea and Vomiting.* Clinical Journal of Oncology Nursing, 2002. **6**(2): p. 94-102.
6. Benedetti, F., et al., *When words are painful: Unraveling the mechanisms of the nocebo effect.* Neuroscience, 2007. **147**(2): p. 260-271.
7. Colagiuri, B., V.F. Quinn, and L. Colloca, *Nocebo Hyperalgesia, Partial Reinforcement, and Extinction.* The Journal of Pain, 2015. **16**(10): p. 995-1004.
8. Faasse, K., et al., *The Influence of Side Effect Information Framing on Nocebo Effects.* Annals of Behavioral Medicine, 2019. **53**(7): 621-629.

Appendix Q: Additional Statistical Output

Variable Names

Table 1

Description of Variables in Additional Statistical Output and Raw Data

Variable Name	Description
Participant Attributes	
PID	Participant ID
OLCond	Observational learning group: 0 = no observational learning; 1 = observational learning
Framing	Framing group: 0 = no warning; 1 = positive framing; 2 = negative framing
OL_F	Experimental groups: 0 = no OL/no warning; 1 = OL/no warning; 2= no OL/positive framing; 3 = OL/positive framing; 3 = no OL/positive framing; 4 = no OL/negative framing; 5 = OL/negative framing
Exclusions	Data excluded from analysis 0: data not excluded, 1: data excluded
Demographic Variables	
Gender	Gender of participant 0: male, 1: female, 2: other
gender 1	Gender variable dummy coded with female as the reference group (1=0) (0=1) (2=0)
gender 2	Gender variable dummy coded with female as the reference group (1=0) (2=1) (0=0)
Age	Age of participant (years)
Prior_VR	Prior VR experience (hours)

Cybersickness Variables	
SSQ_Diff	Difference in SSQ following VR minus baseline SSQ score
Nausea_Diff	Difference in nausea subscale scores between baseline and post-VR
Pre_SSQ	Baseline composite SSQ scores 0-176
Post_SSQ	Post-VR composite SSQ score 0-176
Anxiety Variables	
Anx_Diff	Score on STAI-6 following observational learning and/or framing minus baseline STAI-6 score
Base_Anx	Baseline composite STAI-6 score 0-10
Post_Anx	Pre-VR composite STAI-6 score 0-10
Anx_Cent	Mean centered anxiety difference score
Expectancy Variables	
Exp_Diff	Score on expectancy questionnaire following observational learning and/or framing minus baseline expectancy score
Base_Exp	Baseline response to “How much do you expect to experience symptoms of cybersickness (e.g general discomfort, sweating, nausea) during the VR video?” 0-10
Post_Exp	Pre-VR expectancy score 0-10
Exp_Cent	Mean centered expectancy difference score
Manipulation / Framing	
Memory Check Variables	

manipulation_check	Response to “What do you think was the purpose of this experiment?” 0: matches cover story, 1: indicates true knowledge of the true purpose of the experiment
memory_1	Response to “Do you remember being warned about cybersickness as a side effect of VR?” 0: no, 1: yes
memory_2	Open recall response to “Please fill in the information you were told about experiencing cybersickness as a side effect of Virtual Reality.” 0: no information provided, 1: general type warning, 2: positively framed warning, 3: negatively framed warning
memory_3	Forced-choice response to “Which of the following statements were you presented with at the beginning of the video?” 0: “Didn’t receive any of the above statements.” 1: “From previous research, a proportion of people will experience cybersickness at a level that bothers them”, 2: “From previous research, 7 out of 10 people will not experience cybersickness at a level that bothers them.” 3: “From previous research, 3 out of 10 people will experience cybersickness at a level that bothers them.”.
memory_4	forced choice consistent with warning condition 1: consistent (accurate), 0: inconsistent (inaccurate)
memory_5	open recall consistent with warning condition 1: consistent (accurate), 0: inconsistent (inaccurate)

Moderation Variables	
framingC1	Contrast variable comparing no warning to positive and negative framing
framingC2	Contrast variable comparing positive and negative framing
OLC	Contrast variable OL and no OL
OL_FC1	Contrast for two-way interaction between framingC1 and OL
OL_FC2	Contrast for two-way interaction between framingC2 and OL
fram1xanc_mc	Framing main effect contrast 1 on anxiety
fram2xanc_mc	Framing main effect contrast 2 on anxiety
OLxanx_mc	OL main effect on anxiety
anx2wayc1	Three-way interaction between framing contrast 1, observational learning, and anxiety
anx2wayc2	Three-way interaction between framing contrast 2, observational learning, and anxiety
fram1xexp_mc	Framing main effect contrast 1 on expectancy
fram2xexp_mc	Framing main effect contrast 2 on expectancy
OLxexp_mc	OL main effect on expectancy
exptwowayc1	Three-way interaction between framing contrast 1, OL, and expectancy
exptwowayc2	Three-way interaction between framing contrast 2, OL, and expectancy

Baseline and Demographic Measures

Gender

```
CROSSTABS
  /TABLES=OL_F BY Gender
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ PHI
  /CELLS=COUNT EXPECTED
  /COUNT ROUND CELL
  /METHOD=EXACT TIMER(5).
```

OL_F * Gender Crosstabulation

			Gender			
			Male	Female	Other	Total
OL_F	No OL/No Warning	Count	23	25	0	48
		Expected Count	18.5	29.0	.5	48.0
	OL/No Warning	Count	17	31	2	50
		Expected Count	19.2	30.3	.5	50.0
	No OL/Positive Framing	Count	10	15	0	25
		Expected Count	9.6	15.1	.3	25.0
	OL/Positive Framing	Count	12	12	0	24
		Expected Count	9.2	14.5	.2	24.0
	No OL/Negative Framing	Count	5	19	0	24
		Expected Count	9.2	14.5	.2	24.0
	OL/Negative Framing	Count	8	16	0	24
		Expected Count	9.2	14.5	.2	24.0
Total		Count	75	118	2	195
		Expected Count	75.0	118.0	2.0	195.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	12.675[a]	10	.242	.209		
Likelihood Ratio	12.503	10	.253	.195		
Fisher's Exact Test	10.752			.276		
Linear-by-Linear Association	1.372[b]	1	.241	.251	.129	.017
N of Valid Cases	195					

a. 6 cells (33.3%) have expected count less than 5. The minimum expected count is .25.

b. The standardized statistic is 1.172.

Symmetric Measures

		Value	Approximate Significance	Exact Significance
Nominal by Nominal	Phi	.255	.242	.209
	Cramer's V	.180	.242	.209
N of Valid Cases		195		

Age

```
UNIANOVA Age BY OL_F
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(OL_F)
  /PRINT DESCRIPTIVE PARAMETER
  /CRITERIA=ALPHA(.05)
  /DESIGN=OL_F.
```

Tests of Between-Subjects Effects

Dependent Variable: Age

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	90.963[a]	5	18.193	.557	.733
Intercept	119567.966	1	119567.966	3659.222	.000
OL_F	90.963	5	18.193	.557	.733
Error	6175.724	189	32.676		
Total	139599.000	195			
Corrected Total	6266.687	194			

a. R Squared = .015 (Adjusted R Squared = -.012)

Baseline VR Experience

```
UNIANOVA prior_vr BY OL_F
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(OL_F)
  /PRINT DESCRIPTIVE PARAMETER
  /CRITERIA=ALPHA(.05)
  /DESIGN=OL_F.
```

Tests of Between-Subjects Effects

Dependent Variable: prior_vr

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20.017[a]	5	4.003	1.105	.359
Intercept	256.926	1	256.926	70.904	.000
OL_F	20.017	5	4.003	1.105	.359
Error	684.858	189	3.624		
Total	1003.882	195			
Corrected Total	704.875	194			

a. R Squared = .028 (Adjusted R Squared = .003)

Baseline Cybersickness

```
UNIANOVA Pre_SSQ BY Framing OLCond
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Framing)
  /CRITERIA=ALPHA(.05)
  /DESIGN= Framing OLCond Framing*OLCond.
```

Tests of Between-Subjects Effects

Dependent Variable: Pre-SSQ

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	261.515[a]	5	52.303	.600	.700
Intercept	13033.887	1	13033.887	149.588	.000
Framing	107.547	2	53.773	.617	.541
OLCond	15.321	1	15.321	.176	.675
Framing * OLCond	149.559	2	74.780	.858	.426
Error	16467.901	189	87.132		
Total	31936.000	195			
Corrected Total	16729.415	194			

a. R Squared = .016 (Adjusted R Squared = -.010)

Baseline Anxiety

```
UNIANOVA Base_Anx BY Framing OLCond
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Framing)
  /CRITERIA=ALPHA(.05)
  /DESIGN=Framing OLCond Framing*OLCond.
```

Tests of Between-Subjects Effects

Dependent Variable: Base_Anx

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	26.049[a]	5	5.210	.748	.588
Intercept	15544.154	1	15544.154	2231.844	.000
Framing	23.402	2	11.701	1.680	.189
OLCond	.916	1	.916	.131	.717
Framing * OLCond	2.359	2	1.179	.169	.844
Error	1316.331	189	6.965		
Total	19103.000	195			
Corrected Total	1342.379	194			

a. R Squared = .019 (Adjusted R Squared = -.007)

Baseline Expectancy

```
UNIANOVA Base_Exp BY Framing OLCond
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Framing)
  /CRITERIA=ALPHA(.05)
  /DESIGN=Framing OLCond Framing*OLCond.
```

Tests of Between-Subjects Effects

Dependent Variable: Base_Exp

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13.713[a]	5	2.743	.480	.791
Intercept	1299.660	1	1299.660	227.488	.000
Framing	.344	2	.172	.030	.970
OLCond	2.132	1	2.132	.373	.542
Framing * OLCond	11.887	2	5.943	1.040	.355
Error	1079.774	189	5.713		
Total	2534.000	195			
Corrected Total	1093.487	194			

a. R Squared = .013 (Adjusted R Squared = -.014)

Cybersickness ANCOVAs

SSQ Composite

```
UNIANOVA SSQ_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: SSQ_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3620.850[a]	7	517.264	1.861	.078	.065
Intercept	16243.986	1	16243.986	58.433	.000	.238
gender1	721.228	1	721.228	2.594	.109	.014
gender2	113.240	1	113.240	.407	.524	.002
OLCond	864.596	1	864.596	3.110	.079	.016
Framing	746.500	2	373.250	1.343	.264	.014
OLCond * Framing	666.520	2	333.260	1.199	.304	.013
Error	51984.668	187	277.993			
Total	79576.000	195				
Corrected Total	55605.518	194				

a. R Squared = .065 (Adjusted R Squared = .030)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable SSQ DIFF
L1	Contrast Estimate		-4.458
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.458
	Std. Error		2.528
	Sig.		.079
	95% Confidence Interval for Difference	Lower Bound	-9.445
		Upper Bound	.529

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	864.596	1	864.596	3.110	.079	.016
Error	51984.668	187	277.993			

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ DIFF
L1	Contrast Estimate		3.538
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		3.538
	Std. Error		2.405
	Sig.		.143
	95% Confidence Interval for Difference	Lower Bound	-1.206
		Upper Bound	8.281

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	601.614	1	601.614	2.164	.143	.011
Error	51984.668	187	277.993			

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ DIFF
L1	Contrast Estimate		-2.540
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.540
	Std. Error		3.416
	Sig.		.458
	95% Confidence Interval for Difference	Lower Bound	-9.279
		Upper Bound	4.199

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	153.699	1	153.699	.553	.458	.003
Error	51984.668	187	277.993			

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-6.087
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-6.087
	Std. Error		4.838
	Sig.		.210
	95% Confidence Interval for Difference	Lower Bound	-15.631
		Upper Bound	3.457

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming1

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	440.087	1	440.087	1.583	.210	.008
Error	51984.668	187	277.993			

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		6.182
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		6.182
	Std. Error		6.773
	Sig.		.363
	95% Confidence Interval for Difference	Lower Bound	-7.179
		Upper Bound	19.544

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming2

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	231.629	1	231.629	.833	.363	.004
Error	51984.668	187	277.993			

Nausea Subscale Scores

```
UNIANOVA Nausea_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: Nausea_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1050.421[a]	7	150.060	2.481	.019
Intercept	4015.423	1	4015.423	66.383	.000
gender1	172.265	1	172.265	2.848	.093
gender2	64.305	1	64.305	1.063	.304
OLCond	364.076	1	364.076	6.019	.015
Framing	218.094	2	109.047	1.803	.168
OLCond * Framing	92.825	2	46.413	.767	.466
Error	11311.395	187	60.489		
Total	18410.000	195			
Corrected Total	12361.815	194			

a. R Squared = .085 (Adjusted R Squared = .051)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-2.893
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.893
	Std. Error		1.179
	Sig.		.015
	95% Confidence Interval for Difference	Lower Bound	-5.219
		Upper Bound	-.567

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	364.076	1	364.076	6.019	.015
Error	11311.395	187	60.489		

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		2.127
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		2.127
	Std. Error		1.122
	Sig.		.059
	95% Confidence Interval for Difference	Lower Bound	-.086
		Upper Bound	4.340

Test Results

Dependent Variable: nausea_diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	217.547	1	217.547	3.596	.059
Error	11311.395	187	60.489		

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-.196
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.196
	Std. Error		1.593
	Sig.		.902
	95% Confidence Interval for Difference	Lower Bound	-3.339
		Upper Bound	2.947

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	.915	1	.915	.015	.902
Error	11311.395	187	60.489		

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-2.791
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.791
	Std. Error		2.257
	Sig.		.218
	95% Confidence Interval for Difference	Lower Bound	-7.242
		Upper Bound	1.661

a. Based on the user-specified contrast coefficients (L') matrix:

OLCondxFraming1

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	92.494	1	92.494	1.529	.218
Error	11311.395	187	60.489		

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		.266
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.266
	Std. Error		3.159
	Sig.		.933
	95% Confidence Interval for Difference	Lower Bound	-5.967
		Upper Bound	6.498

a. Based on the user-specified contrast coefficients (L') matrix:
OLCondxFraming2

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	.428	1	.428	.007	.933
Error	11311.395	187	60.489		

Expectancy ANCOVA

2x3 ANCOVA on Expectancy Difference Scores

```
UNIANOVA Exp_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: Exp_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	225.020[a]	7	32.146	10.603	.000	.284
Intercept	135.363	1	135.363	44.649	.000	.193
gender1	.095	1	.095	.031	.860	.000
gender2	3.809	1	3.809	1.256	.264	.007
OLCond	147.969	1	147.969	48.807	.000	.207
Framing	1.899	2	.950	.313	.731	.003
OLCond * Framing	31.248	2	15.624	5.154	.007	.052
Error	566.928	187	3.032			
Total	1029.000	195				
Corrected Total	791.949	194				

a. R Squared = .284 (Adjusted R Squared = .257)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable Exp_Diff
L1	Contrast Estimate		-1.844
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.844
	Std. Error		.264
	Sig.		.000
	95% Confidence Interval for Difference	Lower Bound	-2.365
		Upper Bound	-1.324

Test Results

Dependent Variable: Exp_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	147.969	1	147.969	48.807	.000	.207
Error	566.928	187	3.032			

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Exp_Diff
L1	Contrast Estimate		.156
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.156
	Std. Error		.251
	Sig.		.536
	95% Confidence Interval for Difference	Lower Bound	-.340
		Upper Bound	.651

Test Results

Dependent Variable: Exp_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.163	1	1.163	.384	.536	.002
Error	566.928	187	3.032			

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Exp_Diff
L1	Contrast Estimate		.173
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.173
	Std. Error		.357
	Sig.		.629
	95% Confidence Interval for Difference	Lower Bound	-.531
		Upper Bound	.876

Test Results

Dependent Variable: Exp_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.709	1	.709	.234	.629	.001
Error	566.928	187	3.032			

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Exp_Diff
L1	Contrast Estimate		-.850
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.850
	Std. Error		.505
	Sig.		.094
	95% Confidence Interval for Difference	Lower Bound	-1.846
		Upper Bound	.147

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming1

Test Results

Dependent Variable: Exp_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	8.578	1	8.578	2.830	.094	.015
Error	566.928	187	3.032			

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Exp_Diff
L1	Contrast Estimate		1.944
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		1.944
	Std. Error		.707
	Sig.		.007
	95% Confidence Interval for Difference	Lower Bound	.549
		Upper Bound	3.339

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming2

Test Results

Dependent Variable: Exp_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	22.898	1	22.898	7.553	.007	.039
Error	566.928	187	3.032			

Anxiety ANCOVA

2x3 ANCOVA on Anxiety Difference Scores

```
UNIANOVA Anx_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: Anx_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	182.414[a]	7	26.059	4.694	.000	.149
Intercept	96.360	1	96.360	17.358	.000	.085
gender1	2.755	1	2.755	.496	.482	.003
gender2	4.692	1	4.692	.845	.359	.004
OLCond	153.383	1	153.383	27.629	.000	.129
Framing	3.862	2	1.931	.348	.707	.004
OLCond * Framing	1.963	2	.981	.177	.838	.002
Error	1038.120	187	5.551			
Total	1367.000	195				
Corrected Total	1220.533	194				

a. R Squared = .149 (Adjusted R Squared = .118)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable Anx_Diff
L1	Contrast Estimate		-1.878
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.878
	Std. Error		.357
	Sig.		.000
	95% Confidence Interval for Difference	Lower Bound	-2.582
		Upper Bound	-1.173

Test Results

Dependent Variable: Anx_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	153.383	1	153.383	27.629	.000	.129
Error	1038.120	187	5.551			

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Anx_Diff
L1	Contrast Estimate		.260
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.260
	Std. Error		.340
	Sig.		.445
	95% Confidence Interval for Difference	Lower Bound	-.410
		Upper Bound	.930

Test Results

Dependent Variable: Anx_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	3.247	1	3.247	.585	.445	.003
Error	1038.120	187	5.551			

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Anx_Diff
L1	Contrast Estimate		.155
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.155
	Std. Error		.483
	Sig.		.748
	95% Confidence Interval for Difference	Lower Bound	-.797
		Upper Bound	1.108

Test Results

Dependent Variable: Anx_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.575	1	.575	.103	.748	.001
Error	1038.120	187	5.551			

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Anx_Diff
L1	Contrast Estimate		-.074
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.074
	Std. Error		.684
	Sig.		.914
	95% Confidence Interval for Difference	Lower Bound	-1.423
		Upper Bound	1.275

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming1

Test Results

Dependent Variable: Anx_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.065	1	.065	.012	.914	.000
Error	1038.120	187	5.551			

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Anx_Diff
L1	Contrast Estimate		.560
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.560
	Std. Error		.957
	Sig.		.559
	95% Confidence Interval for Difference	Lower Bound	-1.328
		Upper Bound	2.449

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming2

Test Results

Dependent Variable: Anx_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.903	1	1.903	.343	.559	.002
Error	1038.120	187	5.551			

Regression Analyses

Anxiety Predicting SSQ Composite

```
REGRESSION
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS R ANOVA
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT SSQ_DIFF
 /METHOD=ENTER Gender Anx_Diff.
```

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.700	1.913		4.025	.000
	Gender	3.378	2.344	.101	1.441	.151
	Anx_Diff	1.470	.473	.218	3.109	.002

a. Dependent Variable: SSQ_Diff

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.244[a]	.060	.050	16.503

a. Predictors: (Constant), Anx_Diff, Gender

Expectancy Predicting SSQ Composite

```
REGRESSION
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS R ANOVA
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT SSQ_Diff
 /METHOD=ENTER Gender Exp_Diff.
```

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.274[a]	.075	.065	16.368

a. Predictors: (Constant), Exp_Diff, Gender

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.597	1.961		3.364	.001
	Gender	3.480	2.323	.104	1.498	.136
	Exp_Diff	2.098	.582	.250	3.605	.000

a. Dependent Variable: SSQ_Diff

Anxiety Predicting SSQ Nausea Subscale

```
REGRESSION
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS R ANOVA CHANGE ZPP
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT Nausea_Diff
 /METHOD=ENTER Gender
 /METHOD=ENTER Anx_Diff.
```

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.113[a]	.013	.008	7.952	.013	2.497	1	193	.116
2	.226[b]	.051	.041	7.816	.038	7.756	1	192	.006

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Anx_Diff

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	4.454	.907		4.911	.000			
	Gender	1.783	1.128	.113	1.580	.116	.113	.113	.113
2	(Constant)	4.002	.906		4.416	.000			
	Gender	1.641	1.110	.104	1.478	.141	.113	.106	.104
	Anx_Diff	.624	.224	.196	2.785	.006	.201	.197	.196

a. Dependent Variable: Nausea_Diff

Expectancy Predicting SSQ Nausea Subscale

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Nausea_Diff
  /METHOD=ENTER Gender
 /METHOD=ENTER Exp_Diff
```

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	Change Statistics F Change	Change Statistics df1	Change Statistics df2	Change Statistics Sig. F Change
1	.113[a]	.013	.008	7.952	.013	2.497	1	193	.116
2	.308[b]	.095	.086	7.633	.082	17.443	1	192	.000

a. Predictors: (Constant), Gender

b. Predictors: (Constant), Gender, Exp_Diff

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	4.454	.907		4.911	.000			
	Gender	1.783	1.128	.113	1.580	.116	.113	.113	.113
2	(Constant)	3.283	.915		3.589	.000			
	Gender	1.658	1.083	.105	1.530	.128	.113	.110	.105
	EXPECTANCY DIFFERENCE SCORE	1.133	.271	.287	4.176	.000	.290	.289	.287

a. Dependent Variable: Nausea_Diff

Sensitivity Analyses

Nausea Subscale Excluding Participants with Incorrect Open-Recall

```
USE ALL.
COMPUTE filter_$=((Exclusions=0) AND (memory_5 =1)  ).
VARIABLE LABELS filter_$ '(Exclusions=0) AND (memory_5 =1)    (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.


UNIANOVA Nausea_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: Nausea_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	999.670[a]	7	142.810	2.032	.055
Intercept	2608.896	1	2608.896	37.127	.000
gender1	136.806	1	136.806	1.947	.165
gender2	67.032	1	67.032	.954	.330
OLCond	400.200	1	400.200	5.695	.018
Framing	90.160	2	45.080	.642	.528
OLCond * Framing	33.340	2	16.670	.237	.789
Error	9416.140	134	70.270		
Total	15685.000	142			
Corrected Total	10415.810	141			

a. R Squared = .096 (Adjusted R Squared = .049)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-4.219
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.219
	Std. Error		1.768
	Sig.		.018
	95% Confidence Interval for Difference	Lower Bound	-7.715
		Upper Bound	-.722

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	400.200	1	400.200	5.695	.018
Error	9416.140	134	70.270		

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		1.422
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		1.422
	Std. Error		1.519
	Sig.		.351
	95% Confidence Interval for Difference	Lower Bound	-1.582
		Upper Bound	4.426

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	61.579	1	61.579	.876	.351
Error	9416.140	134	70.270		

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-1.402
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.402
	Std. Error		2.504
	Sig.		.577
	95% Confidence Interval for Difference	Lower Bound	-6.355
		Upper Bound	3.551

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	22.020	1	22.020	.313	.577
Error	9416.140	134	70.270		

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-.939
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.939
	Std. Error		3.080
	Sig.		.761
	95% Confidence Interval for Difference	Lower Bound	-7.030
		Upper Bound	5.152

a. Based on the user-specified contrast coefficients (L') matrix:

OLCondxFraming1

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	6.532	1	6.532	.093	.761
Error	9416.140	134	70.270		

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		2.942
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		2.942
	Std. Error		5.003
	Sig.		.557
	95% Confidence Interval for Difference	Lower Bound	-6.953
		Upper Bound	12.838

a. Based on the user-specified contrast coefficients (L') matrix:

OLCondxFraming2

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	24.304	1	24.304	.346	.557
Error	9416.140	134	70.270		

Nausea Subscale Excluding Participants with Incorrect Forced-Choice Recall

```
USE ALL.
COMPUTE filter_$=((Exclusions=0) AND (memory_4 =1)  ).
VARIABLE LABELS filter_$ '(Exclusions=0) AND (memory_4 =1)   (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.

UNIANOVA Nausea_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: Nausea_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	665.119[a]	7	95.017	1.741	.104
Intercept	3296.419	1	3296.419	60.417	.000
gender1	245.129	1	245.129	4.493	.036
gender2	43.702	1	43.702	.801	.372
OLCond	223.190	1	223.190	4.091	.045
Framing	98.702	2	49.351	.905	.407
OLCond * Framing	33.452	2	16.726	.307	.736
Error	8020.429	147	54.561		
Total	12712.000	155			
Corrected Total	8685.548	154			

a. R Squared = .077 (Adjusted R Squared = .033)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-2.472
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.472
	Std. Error		1.222
	Sig.		.045
	95% Confidence Interval for Difference	Lower Bound	-4.887
		Upper Bound	-.057

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	223.190	1	223.190	4.091	.045
Error	8020.429	147	54.561		

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		1.477
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		1.477
	Std. Error		1.205
	Sig.		.222
	95% Confidence Interval for Difference	Lower Bound	-.905
		Upper Bound	3.859

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	81.931	1	81.931	1.502	.222
Error	8020.429	147	54.561		

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-.873
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.873
	Std. Error		1.615
	Sig.		.590
	95% Confidence Interval for Difference	Lower Bound	-4.065
		Upper Bound	2.319

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	15.924	1	15.924	.292	.590
Error	8020.429	147	54.561		

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		-1.687
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.687
	Std. Error		2.431
	Sig.		.489
	95% Confidence Interval for Difference	Lower Bound	-6.491
		Upper Bound	3.117

a. Based on the user-specified contrast coefficients (L') matrix:
OLCondxFraming1

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	26.272	1	26.272	.482	.489
Error	8020.429	147	54.561		

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable Nausea_Diff
L1	Contrast Estimate		1.132
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		1.132
	Std. Error		3.192
	Sig.		.723
	95% Confidence Interval for Difference	Lower Bound	-5.175
		Upper Bound	7.439

a. Based on the user-specified contrast coefficients (L') matrix:
OLCondxFraming2

Test Results

Dependent Variable: Nausea_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	6.862	1	6.862	.126	.723
Error	8020.429	147	54.561		

Composite SSQ Excluding Participants with Incorrect Open-Recall

```
USE ALL.
COMPUTE filter_$=((Exclusions=0) AND (memory_5 =1)  ).
VARIABLE LABELS filter_$ '(Exclusions=0) AND (memory_5 =1)   (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.

UNIANOVA SSQ_Diff BY OLCond Framing WITH gender1 gender2
/METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
/contrast(Framing)=special(0 -1 1)
/lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
/lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
/CRITERIA=ALPHA(0.05)
/DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: SSQ_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4112.457[a]	7	587.494	1.834	.086	.087
Intercept	9674.137	1	9674.137	30.194	.000	.184
gender1	770.223	1	770.223	2.404	.123	.018
gender2	126.370	1	126.370	.394	.531	.003
OLCond	430.281	1	430.281	1.343	.249	.010
Framing	542.845	2	271.422	.847	.431	.012
OLCond * Framing	1306.552	2	653.276	2.039	.134	.030
Error	42934.029	134	320.403			
Total	66103.000	142				
Corrected Total	47046.486	141				

a. R Squared = .087 (Adjusted R Squared = .040)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-4.375
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.375
	Std. Error		3.775
	Sig.		.249
	95% Confidence Interval for Difference	Lower Bound	-11.841
		Upper Bound	3.092

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	430.281	1	430.281	1.343	.249	.010
Error	42934.029	134	320.403			

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		3.225
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		3.225
	Std. Error		3.243
	Sig.		.322
	95% Confidence Interval for Difference	Lower Bound	-3.190
		Upper Bound	9.639

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	316.716	1	316.716	.988	.322	.007
Error	42934.029	134	320.403			

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-4.047
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.047
	Std. Error		5.348
	Sig.		.451
	95% Confidence Interval for Difference	Lower Bound	-14.624
		Upper Bound	6.530

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	183.490	1	183.490	.573	.451	.004
Error	42934.029	134	320.403			

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-6.518
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-6.518
	Std. Error		6.576
	Sig.		.323
	95% Confidence Interval for Difference	Lower Bound	-19.524
		Upper Bound	6.488

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming1

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	314.794	1	314.794	.982	.323	.007
Error	42934.029	134	320.403			

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		17.781
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		17.781
	Std. Error		10.684
	Sig.		.098
	95% Confidence Interval for Difference	Lower Bound	-3.350
		Upper Bound	38.911

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming2

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	887.450	1	887.450	2.770	.098	.020
Error	42934.029	134	320.403			

Composite SSQ Excluding Participants with Forced Choice Recall

```
USE ALL.
COMPUTE filter_$=((Exclusions=0) AND (memory_4 =1)  ).
VARIABLE LABELS filter_$ '(Exclusions=0) AND (memory_4 =1)   (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.

UNIANOVA SSQ_Diff BY OLCond Framing WITH gender1 gender2
 /METHOD=SSTYPE(3)
/contrast(OLCond)=special(1 -1)
/contrast(Framing)= special(1 -.5 -.5)
 /contrast(Framing)=special(0 -1 1)
 /lmatrix="OLCondxFraming1" OLCond*Framing 1 -.5 -.5 -1 .5 .5
 /lmatrix="OLCondxFraming2" OLCond*Framing 0 -1 1 0 1 -1
/INTERCEPT=INCLUDE
 /CRITERIA=ALPHA(0.05)
 /DESIGN=gender1 gender2 OLCond Framing OLCond*Framing.
```

Tests of Between-Subjects Effects

Dependent Variable: SSQ_Diff

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2189.888[a]	7	312.841	1.396	.211	.062
Intercept	11023.268	1	11023.268	49.187	.000	.251
gender1	570.284	1	570.284	2.545	.113	.017
gender2	36.131	1	36.131	.161	.689	.001
OLCond	398.208	1	398.208	1.777	.185	.012
Framing	402.774	2	201.387	.899	.409	.012
OLCond * Framing	707.857	2	353.929	1.579	.210	.021
Error	32943.880	147	224.108			
Total	49534.000	155				
Corrected Total	35133.768	154				

a. R Squared = .062 (Adjusted R Squared = .018)

Custom Hypothesis Tests #1

Contrast Results (K Matrix)

OL Cond Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-3.302
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-3.302
	Std. Error		2.477
	Sig.		.185
	95% Confidence Interval for Difference	Lower Bound	-8.197
		Upper Bound	1.593

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	398.208	1	398.208	1.777	.185	.012
Error	32943.880	147	224.108			

Custom Hypothesis Tests #2

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		2.196
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		2.196
	Std. Error		2.443
	Sig.		.370
	95% Confidence Interval for Difference	Lower Bound	-2.631
		Upper Bound	7.024

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	181.168	1	181.168	.808	.370	.005
Error	32943.880	147	224.108			

Custom Hypothesis Tests #3

Contrast Results (K Matrix)

Framing Special Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-3.221
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-3.221
	Std. Error		3.273
	Sig.		.327
	95% Confidence Interval for Difference	Lower Bound	-9.690
		Upper Bound	3.248

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	216.976	1	216.976	.968	.327	.007
Error	32943.880	147	224.108			

Custom Hypothesis Tests #4

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		-3.652
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-3.652
	Std. Error		4.927
	Sig.		.460
	95% Confidence Interval for Difference	Lower Bound	-13.389
		Upper Bound	6.085

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming1

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	123.153	1	123.153	.550	.460	.004
Error	32943.880	147	224.108			

Custom Hypothesis Tests #5

Contrast Results (K Matrix)[a]

Contrast			Dependent Variable SSQ_Diff
L1	Contrast Estimate		10.391
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		10.391
	Std. Error		6.468
	Sig.		.110
	95% Confidence Interval for Difference	Lower Bound	-2.392
		Upper Bound	23.174

a. Based on the user-specified contrast coefficients (L') matrix: OLCondxFraming2

Test Results

Dependent Variable: SSQ_Diff

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	578.369	1	578.369	2.581	.110	.017
Error	32943.880	147	224.108			

Mediation Analyses

Expectancy Mediating Effect of OL on Nausea

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 3.5 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : Nau_Diff
    X  : OLCond
    M  : Exp_Diff

Covariates:
 Gender

Sample
Size:  195

**************************************************************************
OUTCOME VARIABLE:
 Exp_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .4884      .2386     3.1407    30.0804     2.0000   192.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      .0868      .2362      .3676      .7135     -.3791      .5528
OLCond       1.9667      .2540     7.7439      .0000     1.4658     2.4677
Gender        .0437      .2516      .1736      .8624     -.4526      .5399

**************************************************************************
```

```
OUTCOME VARIABLE:
 Nau_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3168      .1004    58.2253     7.1033     3.0000   191.0000      .0002

Model
             coeff         se          t          p       LLCI       ULCI
constant    2.8056     1.0174     2.7575      .0064      .7988     4.8125
OLCond      1.3390     1.2527     1.0689      .2865    -1.1320     3.8099
Exp_Diff     .9713      .3107     3.1257      .0021      .3584     1.5842
Gender      1.6300     1.0834     1.5045      .1341     -.5070     3.7670

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 Nau_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2331      .0544    60.8849     5.5179     2.0000   192.0000      .0047

Model
             coeff         se          t          p       LLCI       ULCI
constant    2.8900     1.0400     2.7787      .0060      .8386     4.9414
OLCond      3.2492     1.1182     2.9057      .0041     1.0436     5.4548
Gender      1.6724     1.1078     1.5097      .1328     -.5126     3.8574

..............                                          ..............

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI       c_ps
     3.2492     1.1182     2.9057      .0041     1.0436     5.4548      .4070

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI      c'_ps
     1.3390     1.2527     1.0689      .2865    -1.1320     3.8099      .1677

Indirect effect(s) of X on Y:
            Effect     BootSE   BootLLCI   BootULCI
Exp_Diff    1.9102      .6159      .7499     3.1731

Partially standardized indirect effect(s) of X on Y:
            Effect     BootSE   BootLLCI   BootULCI
Exp_Diff     .2393      .0784      .0931      .4026

************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  10000

------ END MATRIX -----
```

Anxiety Mediating Effect of OL on Nausea

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 3.5 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : Nau_Diff
    X  : OLCond
    M  : Anx_Diff

Covariates:
 Gender

Sample
Size:  195

**************************************************************************
OUTCOME VARIABLE:
 Anx_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3748      .1405     5.4640    15.6888     2.0000   192.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant      -.1717      .3116     -.5509      .5823     -.7862      .4429
OLCond        1.8624      .3350     5.5597      .0000     1.2017     2.5232
Gender         .1636      .3319      .4929      .6227     -.4910      .8181

**************************************************************************
OUTCOME VARIABLE:
 Nau_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2665      .0710    60.1243     4.8682     3.0000   191.0000      .0028

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.9661     1.0343     2.8676      .0046      .9259     5.0063
OLCond       2.4236     1.1973     2.0241      .0443      .0619     4.7853
Anx_Diff      .4433      .2394     1.8518      .0656     -.0289      .9155
Gender       1.5999     1.1015     1.4524      .1480     -.5728     3.7727
```

```
************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 Nau_Diff

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2331      .0544    60.8849     5.5179     2.0000   192.0000      .0047

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.8900     1.0400     2.7787      .0060      .8386     4.9414
OLCond       3.2492     1.1182     2.9057      .0041     1.0436     5.4548
Gender       1.6724     1.1078     1.5097      .1328     -.5126     3.8574

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p       LLCI       ULCI       c_ps
     3.2492     1.1182     2.9057      .0041     1.0436     5.4548      .4070

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI      c'_ps
     2.4236     1.1973     2.0241      .0443      .0619     4.7853      .3036

Indirect effect(s) of X on Y:
            Effect     BootSE   BootLLCI   BootULCI
Anx_Diff      .8256      .5899     -.2118     2.1461

Partially standardized indirect effect(s) of X on Y:
            Effect     BootSE   BootLLCI   BootULCI
Anx_Diff      .1034      .0723     -.0269      .2583


*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  10000

------ END MATRIX -----
```

Moderation Analyses

Effect of Anxiety on Composite SSQ

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT SSQ_Diff
  /METHOD=ENTER Gender Anx_Cent
  /METHOD=ENTER framingC1 framingC2 OLC OL_FC1 OL_FC2
  /METHOD=ENTER fram1xanx_mc fram2xanx_mc OLxanx_mc anx2wayc1 anx2wayc2.
```

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.244[a]	.060	.050	16.503	.060	6.089	2	192	.003
2	.297[b]	.088	.054	16.468	.028	1.164	5	187	.329
3	.321[c]	.103	.044	16.556	.015	.604	5	182	.697

a. Predictors: (Constant), ANX_CENT, Gender

b. Predictors: (Constant), ANX_CENT, Gender, OL_FC2, framingC1, framingC2, OL_FC1, OLC

c. Predictors: (Constant), ANX_CENT, Gender, OL_FC2, framingC1, framingC2, OL_FC1, OLC, Olxanx_mc, fram2xanx_mc, anx2wayc2, anx2wayc1, fram1xanx_mc

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	8.974	1.883		4.765	.000
	Gender	3.378	2.344	.101	1.441	.151
	ANX_CENT	1.470	.473	.218	3.109	.002
2	(Constant)	8.533	1.951		4.373	.000
	Gender	3.217	2.384	.096	1.349	.179
	ANX_CENT	1.206	.510	.179	2.366	.019
	framingC1	3.018	2.363	.089	1.277	.203
	framingC2	-2.634	3.373	-.055	-.781	.436
	OLC	2.056	2.664	.061	.772	.441
	OL_FC1	-2.884	2.384	-.090	-1.209	.228
	OL_FC2	2.760	3.348	.058	.824	.411
3	(Constant)	8.040	2.008		4.004	.000
	Gender	2.972	2.426	.089	1.225	.222
	ANX_CENT	1.204	.589	.178	2.043	.043
	framingC1	2.793	2.587	.083	1.079	.282
	framingC2	-1.981	3.729	-.041	-.531	.596
	OLC	2.142	2.751	.063	.779	.437
	OL_FC1	-3.772	2.609	-.118	-1.446	.150
	OL_FC2	2.828	3.711	.059	.762	.447
	fram1xanx_mc	-1.115	1.091	-.090	-1.022	.308
	fram2xanx_mc	-.021	1.606	-.001	-.013	.989
	OLxanx_mc	1.457	1.188	.100	1.226	.222
	anx2wayc1	-.283	1.096	-.023	-.258	.796
	anx2wayc2	.555	1.609	.027	.345	.731

a. Dependent Variable: SSQ DIFF

Moderation Analysis of Effect of Expectancy on Composite SSQ

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT SSQ_DIFF
  /METHOD=ENTER Gender Exp_Cent
  /METHOD=ENTER framingC1 framingC2 OLC OL_FC1 OL_FC2
  /METHOD=ENTER fram2xexp_mc OLxexp_mc fram1xexp_mc exptwowayc1
exptwowayc2.
```

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.274[a]	.075	.065	16.368	.075	7.775	2	192	.001
2	.305[b]	.093	.059	16.423	.018	.742	5	187	.593
3	.320[c]	.102	.043	16.562	.009	.378	5	182	.863

a. Predictors: (Constant), EXP_CENT, Gender

b. Predictors: (Constant), EXP_CENT, Gender, framingC1, framingC2, OL_FC2, OL_FC1, OLC

c. Predictors: (Constant), EXP_CENT, Gender, framingC1, framingC2, OL_FC2, OL_FC1, OLC, fram2xexp_mc, OLxexp_mc, exptwowayc2, exptwowayc1, fram1xexp_mc

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.910	1.867		4.772	.000
	Gender	3.480	2.323	.104	1.498	.136
	EXP_CENT	2.098	.582	.250	3.605	.000
2	(Constant)	8.380	1.945		4.309	.000
	Gender	3.457	2.376	.103	1.455	.147
	EXP_CENT	1.771	.687	.211	2.577	.011
	framingC1	3.064	2.355	.091	1.301	.195
	framingC2	-2.756	3.365	-.058	-.819	.414
	OLC	1.060	2.783	.031	.381	.704
	OL_FC1	-2.180	2.394	-.068	-.911	.364
	OL_FC2	1.376	3.402	.029	.404	.686
3	(Constant)	8.320	2.171		3.832	.000
	Gender	3.415	2.428	.102	1.407	.161
	EXP_CENT	1.756	.917	.210	1.915	.057
	framingC1	.799	3.062	.024	.261	.794
	framingC2	-4.230	4.281	-.088	-.988	.324
	OLC	.763	3.192	.023	.239	.811
	OL_FC1	-4.388	3.094	-.137	-1.418	.158
	OL_FC2	-.474	4.250	-.010	-.112	.911
	fram2xexp_mc	-1.481	2.453	-.059	-.604	.547
	OLxexp_mc	.481	1.842	.025	.261	.794
	fram1xexp_mc	-1.757	1.758	-.114	-.999	.319
	exptwowayc1	-1.753	1.759	-.110	-.997	.320
	exptwowayc2	-1.214	2.449	-.048	-.495	.621

a. Dependent Variable: SSQ_Diff

Moderation Analysis of Effect of Anxiety on SSQ Nausea Subscale

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Nausea_Diff
  /METHOD=ENTER Gender
  /METHOD=ENTER ANX_CENT
  /METHOD=ENTER framingC1 framingC2 OLC OL_FC1 OL_FC2
  /METHOD=ENTER fram1xanx_mc fram2xanx_mc OLxanx_mc anx2wayc1 anx2wayc2.
```

Model Summary

					Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.226[a]	.051	.041	7.816	.051	5.170	2	192	.007
2	.302[b]	.091	.057	7.750	.040	1.661	5	187	.146
3	.340[c]	.115	.057	7.751	.024	.990	5	182	.425

a. Predictors: (Constant), ANX_CENT, Gender

b. Predictors: (Constant), ANX_CENT, Gender, OL_FC2, framingC1, framingC2, OL_FC1, OLC

c. Predictors: (Constant), ANX_CENT, Gender, OL_FC2, framingC1, framingC2, OL_FC1, OLC, OLxanx_mc, fram2xanx_mc, anx2wayc2, anx2wayc1, fram1xanx_mc

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.542	.892		5.092	.000
	Gender	1.641	1.110	.104	1.478	.141
	ANX_CENT	.624	.224	.196	2.785	.006
2	(Constant)	4.307	.918		4.689	.000
	Gender	1.486	1.122	.094	1.325	.187
	ANX_CENT	.424	.240	.133	1.767	.079
	framingC1	1.866	1.112	.117	1.678	.095
	framingC2	-.194	1.587	-.009	-.122	.903
	OLC	1.997	1.254	.125	1.593	.113
	OL_FC1	-1.295	1.122	-.086	-1.154	.250
	OL_FC2	.019	1.576	.001	.012	.990
3	(Constant)	3.926	.940		4.177	.000
	Gender	1.383	1.136	.088	1.218	.225
	ANX_CENT	.262	.276	.082	.949	.344
	framingC1	1.655	1.211	.104	1.366	.174
	framingC2	.453	1.746	.020	.259	.796
	OLC	2.331	1.288	.146	1.810	.072
	OL_FC1	-1.245	1.221	-.083	-1.019	.310
	OL_FC2	.083	1.737	.004	.048	.962
	fram1xanx_mc	-.058	.511	-.010	-.113	.910
	fram2xanx_mc	-.123	.752	-.013	-.163	.870
	OLxanx_mc	.901	.556	.131	1.620	.107
	anx2wayc1	-.279	.513	-.047	-.544	.587
	anx2wayc2	.561	.753	.058	.744	.458

a. Dependent Variable: Nausea_Diff

Moderation Analysis of Effect of Expectancy on SSQ Nausea Subscale

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Nausea_Diff
  /METHOD=ENTER Gender Exp_Cent
  /METHOD=ENTER framingC1 framingC2 OLC OL_FC1 OL_FC2
  /METHOD=ENTER fram2xexp_mc OLxexp_mc fram1xexp_mc exptwowayc1
exptwowayc2.
```

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2	Sig. F Change
1	.308[a]	.095	.086	7.633	.095	10.076	2	192	.000
2	.344[b]	.118	.085	7.634	.023	.994	5	187	.422
3	.366[c]	.134	.077	7.671	.015	.641	5	182	.669

a. Predictors: (Constant), EXP_CENT, Gender

b. Predictors: (Constant), EXP_CENT, Gender, framingC1, framingC2, OL_FC2, OL_FC1, OLC

c. Predictors: (Constant), EXP_CENT, Gender, framingC1, framingC2, OL_FC2, OL_FC1, OLC, fram2xexp_mc, OLxexp_mc, exptwowayc2, exptwowayc1, fram1xexp_mc

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.532	.871		5.204	.000
	Gender	1.658	1.083	.105	1.530	.128
	EXP_CENT	1.133	.271	.287	4.176	.000
2	(Constant)	4.254	.904		4.706	.000
	Gender	1.581	1.105	.100	1.432	.154
	EXP_CENT	.956	.320	.242	2.990	.003
	framingC1	1.841	1.095	.116	1.682	.094
	framingC2	-.299	1.564	-.013	-.191	.849
	OLC	1.040	1.294	.065	.804	.423
	OL_FC1	-.912	1.113	-.060	-.820	.413
	OL_FC2	-.792	1.581	-.035	-.501	.617
3	(Constant)	4.214	1.006		4.191	.000
	Gender	1.644	1.125	.104	1.462	.146
	EXP_CENT	.863	.425	.218	2.031	.044
	framingC1	.615	1.418	.039	.434	.665
	framingC2	-1.198	1.983	-.053	-.604	.547
	OLC	.749	1.478	.047	.507	.613
	OL_FC1	-1.835	1.433	-.122	-1.281	.202
	OL_FC2	-2.067	1.968	-.092	-1.050	.295
	fram2xexp_mc	-1.427	1.136	-.121	-1.256	.211
	OLxexp_mc	.208	.853	.023	.244	.808
	fram1xexp_mc	-.518	.814	-.071	-.636	.526
	exptwowayc1	-.916	.815	-.122	-1.125	.262
	exptwowayc2	-.747	1.134	-.062	-.658	.511

a. Dependent Variable: Nausea_Diff