

# A ZOOM INTO BODY DYSMORPHIA: INVESTIGATING THE CORRELATIONS BETWEEN VIDEO CALLING DURATION, FOCUS AND BEHAVIOURS ON UK STUDENTS' LEVEL OF DYSMORPHIC CONCERN

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## ABSTRACT

Recent research suggests that 'Zoom dysmorphia', a phenomenon where the use of front-facing cameras on video calls causes changes to self-perception, is on the rise. With students remotely learning, and this cohort being at risk of body image issues, it is essential to understand the relationship between video calling and a negative self-view, so-called 'Zoom dysmorphia'. This partial replication study used part of the method from a previous study, and aimed to investigate if there were significant correlations between video call duration, focus and manipulation behaviours against dysmorphic concern scores in a UK-based student sample. Utilising this cohort was essential to understanding the impact remote learning can have on an at-risk sample. An online questionnaire was attempted by 68 participants and completed fully by 49 students. The survey included questions on demographic information, video call behaviours and the Dysmorphic Concern Questionnaire (DCQ). Although the results surrounding video call duration were inconclusive, participants who claimed to focus on their own face the most (in comparison to focusing on other faces or extraneous screen-based activities) while on video calls had the highest overall DCQ scores and one video manipulation tactic was significant in predicting DCQ scores: positioning/camera angle adjustment. Consequently, there are links between video calling and dysmorphic concern, supporting Zoom dysmorphia as a phenomenon. Possible explanations for these results were explored such as mirror checking behaviours and avoidance tactics. Safeguarding practices such as reduced on-camera screen time were proposed and directions for future research into turning of cameras on video calls was suggested.

## INTRODUCTION

The COVID-19 pandemic has triggered a technological evolution in how society communicates (Ali, 2020). To reduce coronavirus transmission, many universities utilised remote learning (Daniel, 2020). This mode of education consists of teaching materials being uploaded online and academics engaging in classes mostly through on-camera conference calling (Burki, 2020). This change in learning has been shown to have negative effects on students' mental wellbeing including academic stress (Horita, Nishio and Yamamoto, 2021; Clabaugh, Duque and Fields, 2021; Oducado and Estoque, 2021), and learning fatigue (Oducado et al., 2021; Salim et al., 2022.), although it is not understood how this increase of video calling is impacting students' self-image. Recent literature has proposed that there is a relationship between video calling and dysmorphic concern (defined as an obsession with a minor or invisible flaw in one's appearance which can lead to excessive behaviours to reduce its visibility (Oosthuizen, Lambert and Castle, 1998)); this phenomenon has been named 'Zoom dysmorphia' (Pfund, Hill and Harriger, 2020; Ratan, Miller and Bailenson, 2021; Gasteratos, Spyropoulou and Suess, 2021). As defined by Rice, Graber and Kourosh (2020), Zoom dysmorphia occurs when individuals develop a negative sense of self-appearance due to repeated exposure from viewing oneself on video-conferencing software. This study investigated the relationship between video calling and dysmorphic concern in students.

Dysmorphic concern is most evident in body dysmorphic disorder (BDD), a mental disorder where one has 'excessive concern' about their self-image including 'imagined' or 'exaggerated' flaws in their appearance (Bulut et al., 2018). Patients become preoccupied with these flaws which can cause them to engage in repetitive behaviours such as mirror gazing and body checking (Hardardottir, Hauksdottir and Bjornsson, 2019). The onset of BDD can be brought on by stressful life events (Weingarden et al., 2017), with incidence rates being

even higher in university students (Hakim et al., 2021). Consequently, symptoms of BDD have increased during and post-lockdown (Hool, 2020) in addition to increases of body dissatisfaction in students (Nieto, Ortiz and Mendoza, 2021; Robertson et al., 2021). Few articles have explored the relationship between dysmorphic concern and the COVID-19 pandemic lockdown in a strictly student sample. Therefore, a student sample would be beneficial to utilise when investigating dysmorphic concern and video calling behaviours and thus, zoom dysmorphia.

Video calling can be problematic in how users can perceive their appearance. Video calling allows the user, in addition to seeing their correspondent, to view a live broadcast of their appearance on-screen (similar to a mirror reflection): an image that users are not accustomed to when in face-to-face conversations. Recent research has shown that longer duration of gaze when looking into a mirror was correlated with lower self-esteem (Potthoff and Schienle, 2021) and negative body image (Hosseini and Padhy, 2019). Furthermore, mirror gazing (repeatedly checking one's appearance in a mirror) has been repeatedly linked to dysmorphic concern (Soler, Harada Ferreira and da Silva Novaes, 2018; Worrall, 2020; Jafferany, 2022). Barnier and Collison (2019) found that focusing on a disliked part of themselves in the mirror at a short distance (10cm) negatively impacted body image perception, satisfaction and self-esteem. It is possible that due to increases of online learning video calls, students are studying their faces more than they did pre-pandemic (Fosslien and Duffy, 2020). Therefore, time spent on video calls could be correlated to higher levels of dysmorphic concern.

Another aspect of video call usage that could affect levels of dysmorphic concern is how self-view can be distorted. Rice et al. (2021) explain how video conferencing could influence dysmorphic concern as users are continuously gazing, unintentionally, at a warped vision of themselves—caused by mistranslated facial proportions being transferred from camera

to screen. BDD is defined as an increased captivation on a personal appearance flaw which can be invisible or subtle to others (Silvestro and Vohnoutka, 2021). Therefore, staring for prolonged periods of time at a distorted amalgamation of one's face could result in a negative self-view and, therefore, increased dysmorphic concern.

Those with high dysmorphic concern scores are reported to be statistically significantly more critical of their own perceived flaws than others' flaws (Kollei et al., 2017; Dhir et al., 2018). This is claimed to be caused by attentional biases and irregular visual scanning rituals that BDD patients possess due to an imbalanced perception of global versus detail visual processing: focusing on minute details of the face instead of seeing it collectively, as shown in eye-tracking studies (Brennan, 2018; Beilharz, 2019; Carhoun and Topfer, 2020). Additional research has found an increase of amygdala activity in BDD patients compared to control samples (Soler, Harada Ferreira and da Silva Novaes, 2018; Grace et al., 2019; Borgers et al., 2022). This area of the limbic system participates in controlling emotional processing, including threatening stimulants (Kang et al., 2021). It is possible that BDD patients and those with high levels of dysmorphic concern are more sensitive to negative stimuli. Consequently, if people are repeatedly exposed to their own 'distorted' faces on video calls, we could predict that those who stare at their own image the most will have higher dysmorphic concern scores.

Moreover, Zoom dysmorphia is not the only phenomena that links screen usage and dysmorphic concern. 'Snapchat dysmorphia' is defined as the condition of someone who has a hyperfixation on the perceived negative aspects of their appearance due to viewing themselves through various appearance-enhancing filters through the smartphone application 'Snapchat' (Eshiet, 2020). These Snapchat filters can slim noses and reduce jawlines, which can cause users to feel dissatisfied with their unfiltered appearance (Barker, 2020). Similarly, selfie-viewing (filtered and unfiltered) was predictive of increases of facial dissatisfaction, self-objectification (Wang, Yang, and Haigh, 2017; Wang et al., 2021), appearance concerns, and body dissatisfaction (Song and Johnson, 2020) in young people. This literature indicates that gazing at one's appearance through screens can be detrimental to self-perception. Video calling software can allow the user to apply live facial filters, including a 'touch up my appearance' button which smooths over the user's 'imperfections' (Feed, 2021). Through this argument, it could be predicted that filter use in video conference calling will be a significant predictor of dysmorphic concern.

Despite this past research on filters, few recent studies have investigated the link between appearance dissatisfaction and other video calling manipulation behaviours. Video call users have used manipulation behaviours to improve their appearance on camera such as using live filters (Leong et al., 2021), locating good lighting (Karl, Peluchette and Aghakhani, 2021), adjusting camera angles (Chen et al., 2021) and applying makeup before attending meetings (Sander and Baumann, 2020). However, there is limited research on these video call behaviours and their relationship to dysmorphic concern in students.

Pikoos et al. (2021) investigated video calling behaviours, interest in cosmetic procedures and their relationship with dysmorphic concern in the general population. Participants completed an online survey which included questions surrounding video call behaviour, the Dysmorphic Concern Questionnaire (DCQ) and whether participants would be likely to partake in beauty treatments. Over 33% of participants had noticed a new concern about their looks while on video calls. Participants who noticed new concerns were more likely to want to partake in aesthetic procedures. Higher DCQ scores

were also correlated with self-focused attention and more physical concerns were correlated with longer video call duration. However, time spent on video calls per week was not significantly correlated with DCQ scores. The video manipulation tactics of using filters, self-grooming and using lighting to improve participants' appearance were significant predictors of DCQ scores. The findings collated in Pikoos et al. (2021) have further supported Zoom dysmorphia as a phenomenon.

Although Pikoos et al. (2021) did not find evidence of a correlation between video call duration and DCQ scores, the participant sample was not comprised exclusively of students. Therefore, these findings are generalisable to those of all populations. Previous research shows a strong relationship between on camera screen usage and body dysmorphia (Burnell, Kurup and Underwood, 2021), specifically in young people (Himanshu, Kaur and Singla, 2020). Additionally, emerging adolescents and young adults have high incidence rates of body dysmorphia (Ahamed et al., 2016; Veale et al., 2016; Enander et al., 2018; Hakim et al., 2021). With most undergraduate students being under 24 years of age (Castell and Wake, 2022), if there is a relationship between video call duration and attention with body dysmorphia, it should be shown in a replicatory analysis with a young student sample.

A replication of the Pikoos paper's methodology with student participants would determine if there are similar correlations between video call usage, attentional focus and on-screen video manipulation behaviours in relation to DCQ scores in this at-risk sample. High levels of dysmorphic concern have been linked to suicide (Eskander, Limbana and Khan, 2020) and lower quality of life (Siegfried, Ayrolles and Rahioui, 2018). More specifically, students with BDD are more likely to show symptoms of anxiety, depression and low self-esteem than students without this condition (Grant, Lust and Chamberlain, 2019). This study also showed that students with BDD are more likely to perform poorly academically. Similarly, students with higher levels of dysmorphic concern are more likely to drop out of education (Rautio et al., 2020). It is, then, important for educational institutions to understand if video calling is causing increases of dysmorphic concern in students.

If these correlations between video calling behaviours and dysmorphic concern are replicable, the phenomena of Zoom dysmorphia will be supported. Consequently, educational institutions should then consider encouraging students to turn their cameras off, reducing video call duration of their online curriculum and employing measures to reduce the prevalence of these mental health consequences in student populations.

With this literature in mind and an overall aim of investigating Zoom dysmorphia, the following hypotheses are posed:

1. There will be a positive relationship between duration of time spent on video calls and Dysmorphic Concern Questionnaire scores in university students.
2. University students who report to fixate on their own face on-screen in video calls will have overall higher Dysmorphic Concern Questionnaire scores than students who fixate on others faces and students who fixate on a combination of their own faces and other people's faces while on video calls.
3. Self-reported video manipulation behaviours on video calls will be predictors of Dysmorphic Concern Questionnaire scores in university students.

## METHODS

### Participants

This study, a partial replication of Pikoos et al. (2021), aimed to investigate the links between video calling and dysmorphic concern in a non-clinical sample of UK-based students through an online questionnaire. The survey asked respondents to give their relevant demographic information, information on video calling behaviours and to complete the DCQ.

68 participants attempted to complete the study (39 females, 28 males and 1 gender diverse individual), aged between 18-24 (mean [standard deviation], 20.85 [1.69] years). 19 participants partially completed the study (finished the DCQ but failed to answer other sections of the survey). Participants were UK-based students and did not have a history of BDD (these criteria were included so that the data could be used to test the relationship between dysmorphic concern and video calling without a pre-existing diagnosis of BDD).

### Ethics

The main ethical consideration in this study was the risk of investigating dysmorphic concern in a non-clinical sample. It is important to ensure that no harm comes to participants by bringing this topic into conversation. To reduce the risk of harm, it was ensured that participants were aware of the study's subject matter before participating. Respondents were advised to not participate if they were at risk for their mental wellbeing to be negatively affected. Furthermore, mental health resources were linked for participants to use if they needed guidance.

This research was conducted in line with the BPS ethical guidelines and ethical approval was gained from the University of Glasgow's Board of Ethics.

### Measures

#### Video Call Usage and Behaviour

To measure video call duration, participants were asked how many hours in the past week they had spent on video call applications. These answers were coded from 1-5 respectively. Attentional focus data was collected by asking participants what they paid the most attention to when on screen on video calls. Participants were asked whether they had performed any video manipulation behaviours to improve their appearance to make themselves look 'better' when visible on camera.

#### Body Dysmorphic Concern Scores

Participants were asked to complete the DCQ (Oosthuizen, Lambert and Castle, 1998). Permission to use this scale was granted by David Castle, a developer of the DCQ. The DCQ is a 7-itemed measure which calculates how concerned an individual is about their physical appearance and how worried they are that they look flawed whether these flaws are visible or subtle. Every question produced a score for each participant, ranging from 0-3, with 3 being the most concerning indicator for BDD symptoms. These answers were then summed to create an overall DCQ score for each participant. High scores in this questionnaire have been linked to the prevalence of BDD (Kapsali, Nikolaou and Papageorgiou, 2020) and eating disorders (Beilharz et al., 2019; Jenkins et al., 2020).

#### Data collection

The online study was run on the website, Experimentum (created by DeBruine et al., 2020). An online methodology was used to make the study more accessible to students due to off-campus learning. Participants were invited to complete the

questionnaire through an Experimentum link advertised on social media websites (Facebook, Instagram, Twitter, Reddit) and online university platforms (Microsoft Teams, university chat rooms). Participants were shown an information sheet (Appendix A) and a page where respondents were asked to print their name and the date to consent to participating in the study (Appendix B). The debrief is available under Appendix D.

## ANALYSIS

All data analysis was conducted on RStudio (Rstudio Team, 2020). The packages utilised to perform this analysis were tidyverse (Wickham et al., 2019), rstatix (Kassambara, 2021) and pwr (Champely, 2020). All data files and coding scripts can be made available upon request whilst respecting participants' right to anonymity.

Descriptive statistics were summarised for participants with demographic data (N = 52). Answers from the video call purpose section (N = 60) and the total DCQ scores for each participant (N = 60) were totalled. A Shapiro-Wilk test was conducted to determine if the results from the DCQ were normally distributed. A Games-Howell post-hoc test was conducted to determine if participants who avoided video calling had higher DCQ scores than those who did not avoid video calls.

To test the first hypothesis (that video call duration was linked to DCQ scores), participants' scores on how many hours in the past week they had spent on video calls were collated and compared to overall DCQ total scores. A Spearman's correlation between DCQ total scores and video call usage duration scores was then conducted to test the strength of this relationship. Finally, a power analysis was conducted on this relationship to test the level of power this correlation held and the sample needed to achieve a statistical power of 0.8: a power of above 0.8 highlights a correlation of significance.

To test the second hypothesis (that participants who focused on their own face the most when partaking in on-camera video calls would have the highest mean DCQ scores), the number of respondents selecting each facial attentional focus was collated (N = 51). A Kruskal Wallis test was then conducted to test if there was a significant difference in DCQ scores between participants focusing on their own face, another face, both faces while on video conferencing software. Games-Howell post-hoc tests were conducted to investigate which facial focus when on video calls had the highest overall DCQ scores and if the differences in DCQ scores between the groups were significant.

To test the third hypothesis (that video manipulation tactics would be significant predictors of DCQ scores), percentages were calculated for the proportion of participants who engaged in each video call manipulation behaviour. A bar graph was designed to demonstrate this data.

Appropriate testing was carried out between potential covariates (variables that could affect the predictor model such as age and gender), and covariates of DCQ scores were then controlled for. Analysis on participants' gender only included data from participants who stated that they were either male or female due to the limited sample of participants who stated they were gender diverse (1/52, 1.8%).

To test the hypothesis, all video manipulation behaviours, controlled for covariates and singular facial attentional foci were then entered as predictors in a multiple regression model with the DCQ scores as the outcome variable. This regression model and a model with only the significant predictors included were compared in an analysis of variance (ANOVA) to test which model was the better predictor of DCQ scores.

**RESULTS**

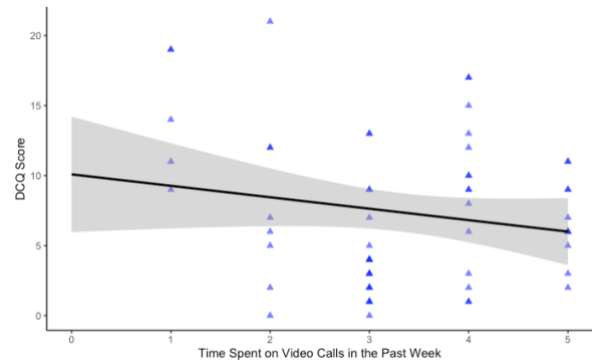
The Experimentum survey was attempted 68 times and entirely completed by 49 respondents. The 19 participants who completed the DCQ but failed to complete the entirety of the survey were included in the results of the study where all data necessary was submitted in their attempt. Participants with missing data were included in the results to compensate for the small sample size (N = 19). Participants with missing data were included for each hypothesis if they answered the questions necessary for subsequent analysis. Participants' demographic information, where reported, is shown in Table 1.

**Table 1: Available Demographic Information of Participants (N = 68)**

Characteristic	Statistic
Age, mean [SD]	20.85 [1.69]
Gender, n (%)	
Female	39 (57.4%)
Male	28 (41.2%)
Gender Diverse	1 (1.8%)
DCQ Total Score, mean [SD]	7.33 [5.26]

*Table 1.* Table showing participants' demographic information. DCQ: Dysmorphic Concern Questionnaire, scores range from 0 to 21. SD: standard deviation.

Out of 58 respondents, 54 (91.5%) reported using video calling software in the week prior to completing the survey. Most participants used video calls for work/educational purposes ( $n = 41, 70.7\%$ ) and/or for social purposes such as conversing with friends and family ( $n = 40, 69.0\%$ ). A minority of three participants reported to actively avoid video



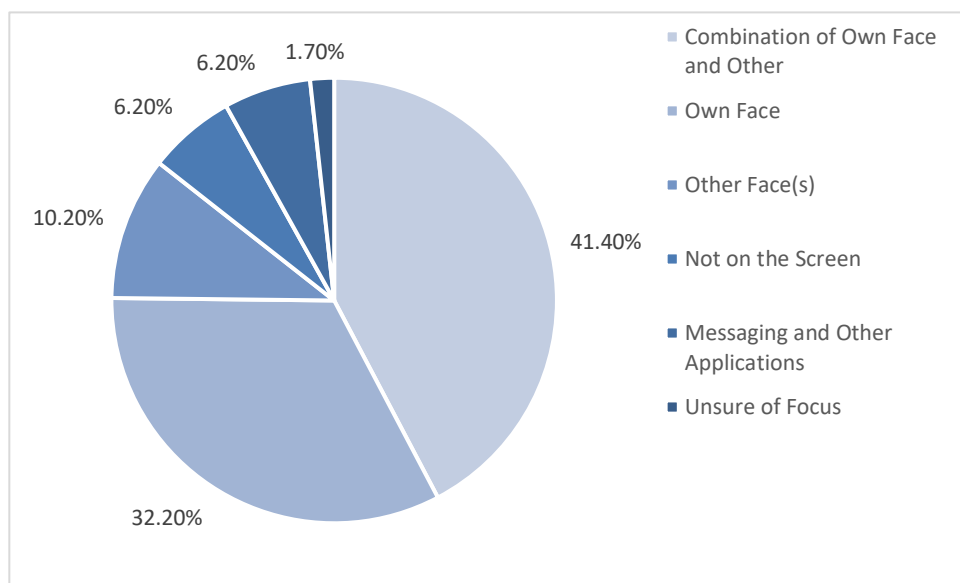
**Figure 2: The Relationship between Video Call Duration and DCQ Scores (N = 59)** Each triangle represents one participant, darker shaded triangles represent two or more participants with the same scoring coordinates. The regression line shows the line of best fit for DCQ scores in relation to self-reported video call duration.

calls (5.2%). A Games Howell post-hoc test revealed that respondents who actively avoided video calls (mean = 13.33, [5.13]) reported higher DCQ scores than those who did not (mean = 6.89, [5.08]), however, this relationship was not statistically significant.

DCQ scores for each participant were summed to create total DCQ scores, A Shapiro-Wilk test showed that the distribution of DCQ total scores was significantly non-normal ( $W = 0.94, p < .005$ ) and thus, Spearman's correlations were conducted on DCQ related analyses.

Hypothesis 1: There will be a significant positive relationship between duration of time spent on video calls and Dysmorphic Concern Questionnaire scores in university students.

In the week prior to completing the survey, five (8.5%) participants claimed to spend no time on video calls, eight (13.6%) stated that they spent less than 30 minutes, 20 (33.9%)



**Figure 3.** Pie chart showing the percentage of participants (N = 60) who reported each attentional focus when on video conferencing software. Figures surrounding the circumference of the chart indicate the percentage of participants who reported engaging in that attentional focus the most.

reported spending 30-60 minutes on video calls, 15 (25.4%) claimed to spend 1 to 2 hours and 11 (18.6%) stated that they spent more than 2 hours a day on video conferencing software.

Figure 2 indicates a weak, negative relationship between DCQ scores and video call duration. This suggests that there is an insignificant relationship between DCQ scores and duration of time spent on video calls. A Spearman's correlation test showed an insignificant negative correlation between DCQ scores and time spent on video calls ( $r(57) = 0.05$ ,  $p = 0.694$ ) and thus, hypothesis 1 is rejected.

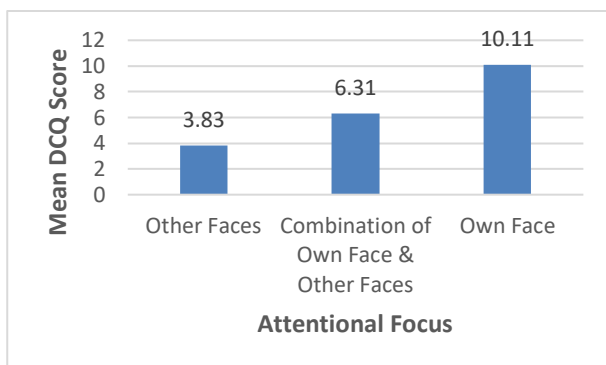
A correlation power analysis was conducted to determine the power of the relationship between video call duration and dysmorphic concern. A power of 0.067 was found. To achieve the recommended statistical power of 0.8 with an effect size of -0.05, a sample of 2873.53 would have been necessary.

Hypothesis 2: University students who report to fixate on their own face on-screen in video calls will have overall higher Dysmorphic Concern Questionnaire scores than students who fixate on other faces and students who fixate on a combination of their own faces and other people's faces while on video calls.

Most respondents claimed to focus on a combination of their own face and other faces when on video calls ( $n = 26$ , 44.1%). The second most reported attentional focus was focusing on their own face exclusively ( $n = 19$ , 32.2%). Focusing on other faces was the next most prevalent answer ( $n = 6$ , 10.2%). Those who stated that they were not focusing on the screen at all and those who claimed to focus on messaging or other screen activities were identical in prevalence ( $n = 4$ , 6.8%). A single participant was unsure of their focus ( $n = 1$ , 1.7%).

A Kruskal Wallis test was conducted to test if there was a significant difference in DCQ scores between the facial attentional foci. The results showed that there was a significant difference in DCQ scores between the attentional foci of focusing on each participant's own face, another face or both faces on video calls,  $H(2) = 8.31$ ,  $p < 0.05$ .

Through a Games-Howell post-hoc test, it was shown that participants who focused on their own face had the highest DCQ scores (mean, 10.11 [5.35]) with respondents who focused on a combination of their own face and other callers' face(s) scoring second (mean, 6.31 [5.39]) and individuals who focused primarily on other people's faces scored lowest DCQ scores (mean, 3.83 [2.93]). The Games-Howell post-hoc test revealed that the difference of DCQ scores between the groups who focused on both faces against those who focused on other faces was not significant ( $p > 0.05$ ). Similarly, the difference of DCQ scores between the groups who focused on both faces against those who focused on their own face was not significant ( $p > 0.05$ ). However, the difference between participants who focused on their own faces and participants who focused on

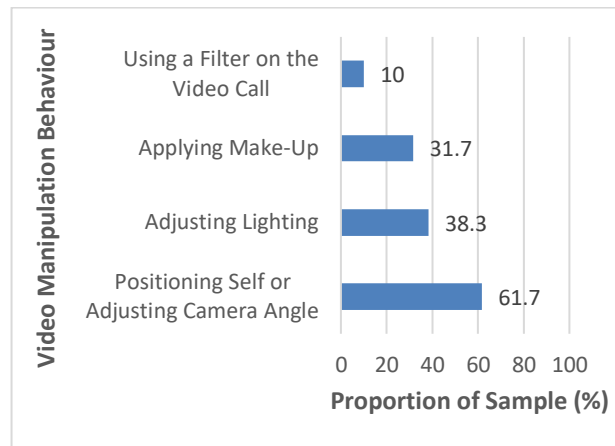


**Figure 4: Mean DCQ scores for each facial attentional focus ( $N = 51$ ).**

other faces on video calls in relation to DCQ scores was significant ( $p < 0.05$ ). Consequently, there is evidence to support the second hypothesis.

Hypothesis 3: Self-reported video manipulation behaviours on video calls will be predictors of Dysmorphic Concern Questionnaire scores in university students.

Of the 56 participants who completed this section of the questionnaire, 44 (78.6%) reported that they partook in at least one video manipulation tactic. A majority of 37 (61.7%) participants claimed to position themselves or adjust their camera to appear more attractive on camera. 23 (38.3%) respondents reported adjusting their lighting and 19 (31.7%) participants claimed to apply makeup for appearing on video calls. Finally, 6 (10%) respondents reported using a filter over their face whilst video conferencing. A bar graph depicting the percentages of participants who engaged in each video manipulation behaviour are shown in Figure 5.



**Figure 5: Proportion of participants engaging in video-manipulation behaviours ( $N = 56$ ).**

To detect potential covariates, analysis was conducted between age and gender against DCQ scores. A Pearson's test showed that DCQ scores were not significantly correlated with age ( $r(58) = 0.03$ ,  $p = 0.799$ ). A Games Howell post-hoc test showed that DCQ scores were significantly different between genders ( $p < 0.05$ ) with higher dysmorphic concern observed in females (mean = 8.42, [5.78]) than in males (mean = 5.71, [3.94]).

A multiple-regression analysis (Model 1) was conducted to determine how well different variables (focusing on own face, focusing on other face, use of lighting, use of makeup, use of filters and use of positioning) predicted DCQ scores. The potential covariate, gender, was controlled for (Model 2). The regression model showed that the video manipulation tactic of adjusting positioning on camera contributed significant variance. The linear model of positioning alone (Model 3) was significantly correlated to DCQ scores,  $F(49) = 16.8$ ,  $p < 0.001$ . This predictor alone represented 24% of variance in DCQ scores. However, an ANOVA showed that the model of positioning alone (Model 3) was not as significant as the model including all variables (Model 1) at predicting DCQ scores. Consequently, there is not enough evidence to support hypothesis 3. The results of the regression analyses of all models are shown in Table 2.

Table 2 shows the output from three regression models. The dependent variable used for the regression models was Dysmorphic Concern Questionnaire (DCQ) sum scores. Predictor: variables in the regression model. Adj  $R^2$ : adjusted  $r$  squared.  $b$ : unstandardised beta.  $SE_b$ : standard error of unstandardized beta.  $t$ :  $t$  value.  $p$ :  $p$  value.  $F$ -Change: result of the ANOVA between models to test for the significance of an

R square change. Model 1: regression model including the variables of gender, video manipulation tactics (use of lighting, positioning, filters and make up on video calls) and attentional foci (focusing on own face and focusing on another face while on video calls). Model 2: regression model including the variable of gender. Model 3: regression model including the variable of positioning. Rows that are shaded blue represent variables with significance ( $p < 0.05$ ).

## DISCUSSION

This research investigated the relationships between video calling duration, attentional focus and manipulation tactics with dysmorphic concern in a non-clinical UK-based student sample. Video call duration did not show a significant positive relationship with dysmorphic concern scores and thus, hypothesis 1 was rejected. Furthermore, hypothesis 3 was rejected, as the singular significant predictor of dysmorphic concern in the regression model was the video manipulation tactic of positioning. However, hypothesis 2 was supported, as respondents with higher dysmorphic concern scores were more likely to focus on their own face while video calling with others.

Despite the mean DCQ score of this study's student sample (7.33, [5.26]) being higher than the mean DCQ score of the general population sample (6.25, [5.21]) found in Pikoos et al. (2021), this study's findings surrounding video call duration and dysmorphic concern scores were insignificant. Unexpectedly, when video call duration increased, DCQ scores decreased, and thus the relationship detected was negative. A possible explanation for this direction of relationship could be that those with higher levels of dysmorphic concern were avoiding video calls. Mirror avoidance has been frequently reported in patients with BDD (Ayub, Kimong and Ee, 2018; See Bjornsson, 2020; Jafferany, 2022). Therefore, participants with higher DCQ scores may avoid video calls to evade viewing themselves on screen. This has been supported by Castelli and Sarvary (2021) who found that students avoid seeing themselves on video calls due to their physical appearance. Nonetheless, although the mean DCQ score of those who avoided video calls was higher than those who did not avoid calls, this difference was not significant. It may be that the duration of time on video calls is not significantly associated with dysmorphic concern; however, what users are focusing on may be causal in explaining dysmorphic concern.

The power analysis showed that a participant sample of at least 2874 would have been required to show a significant relationship between video call duration and DCQ scores. It is possible that a significant relationship could be detected between these variables with a larger subject pool. Therefore, a replication of this analysis with more participants would be beneficial.

The second hypothesis of this study predicted that students who focused primarily on their own face when on video calls would have an overall higher DCQ score than students who focused on other faces while on video calls. Although the most popular attentional focus was fixating on a combination of faces, the highest mean DCQ score of the facial focus groups was the fixation of participants' own faces. This difference in DCQ scores was also shown to be significant between those who focused on their own face versus those who focused on other faces. However, the difference of DCQ scores between the foci of the combination of faces against focusing primarily on either participants' own face or other faces was not significant. This selective personal focus is documented in BDD literature: People with BDD can have visual processing deficits and tend to hyper-fixate on the perceived negative aspects of their bodies (Toh, Castle and Rossell, 2017; Johnson, Williamson and Wade, 2018; Dhir et al., 2018; Dondzilo et al., 2021). In

addition to video calling applications and computer cameras warping one's appearance (Murphy, 2020; Choudhury, 2021; Silence, Rice and Kourosh, 2022), it is clear as to why those with high DCQ scores would focus on their own face.

A possible explanation as to why the differences of DCQ scores between the other foci was not significant could be that those with dysmorphic concern symptomatology could be partaking in appearance comparisons. The World Health Organization (2019) states that in patients with BDD, comparing their personal appearance to that of others is another way to bring more exposure to their own 'flaws'. Anson, Veale and Miles (2015) found that individuals with BDD are significantly more likely to partake in appearance comparisons, focusing primarily on comparing features that the patient feels are most flawed. This could explain why the comparisons of DCQ scores between the foci of own face and other face against the focus of a combination of faces is not significant.

The third hypothesis aimed to investigate video manipulation behaviours while on video calls and if they predict dysmorphic concern scores. Most respondents claimed to exhibit at least one video manipulation behaviour to 'enhance' their appearance while video conferencing. In contrast with Pikoos et al. (2021), this current study recognised only one video manipulation tactic as a significant predictor of dysmorphic concern: positioning oneself or adjusting one's camera in a way to appear more attractive whilst on video calls. Past research has shown that the 'need to be camera ready' can be linked to body image concerns in young people (Choukas-Bradley et al., 2020) and that those who edit their photos have higher body image concern than those who do not (Verrastro et al., 2020). Since video calls show the participants' reflection in real time, this can allow people to 'self-edit' (Taber, Dominguez and Whittaker, 2021) and 'self-monitor' (Ngien and Hogan, 2022) their behaviour and looks. It is possible that individuals are using positioning and camera angles as a way of editing themselves to look more attractive while on video calls.

Although adjusting lighting, applying makeup and using a filter whilst video conferencing were not significant predictors of dysmorphic concern in this study, these behaviours were significant predictors of DCQ scores in Pikoos et al. (2021). Makeup usage has been linked to dysmorphic concern, specifically in females, (Fisher, 2018) and research suggests that cosmetics allow those with BDD to 'camouflage' their perceived flaws, enabling them to present themselves more comfortably to others (Sun and Rieder, 2021; Zhang et al., 2021). However, makeup use for the concealment of flaws is not only prevalent in those diagnosed with BDD as non-clinical students also report this reasoning (Ruda, 2018; Doh and Hwang, 2020; Robertson and Kingsley, 2021). Lighting has been utilised equivalently to hide self-viewed flaws in those diagnosed with BDD (Oakes, Collison and Milne-Home, 2017) and in the general population (Cruz, 2019). Similar findings have been shown regarding filter use: with claims being made that filters are being used both by those with high levels of dysmorphic concern (Perkins, 2019) and the general population (Qutub, 2021). Therefore, simply engaging in these behaviours may not be an accurate predictor of dysmorphic concern. One manifestation of BDD is the use of 'repetitive behaviours' in response to the preoccupation of perceived flaws (Hardardottir, Hauksdottir and Bjornsson, 2019). Consequently, testing for the frequency and/or severity of these video manipulation behaviours on video calls may show a more significant relationship with dysmorphic concern.

Predictor	Adj R <sup>2</sup>	b	SE <sub>B</sub>	t	p	F-Change
Model 1	.316				P = .001	
Intercept		-1.03	3.0111	-0.341	0.735	
Gender		2.08	1.5477	1.346	0.186	
Lighting		2.13	1.5424	1.380	0.175	
Positioning		3.89	1.6679	2.332	< 0.05	
Filters		2.14	2.0136	1.061	0.295	
Make Up		0.11	1.3905	0.079	0.938	
Focus on Own Face		2.86	1.4486	1.976	0.055	
Focus on Another Face		-1.00	2.4464	-0.407	0.686	
Model 2	.031				P = 0.115	Model 2 vs Model 1
Intercept		3.31	2.680	1.235	0.223	F = 4.408, P = 0.001
Gender		2.53	1.579	1.604	0.115	
Model 3	.240				P = 0.001	Model 3 vs Model 1
Intercept		2.93	1.29	2.27	< 0.05	F = 1.906, P = 0.102
Positioning		6.21	1.51	4.10	< 0.001	

**Table 2: Multiple Regression Analyses of Variables and their Prediction of Dismorphic Concern (N = 49).**

In conclusion, video calling is and has been an important tool to continue social connection (Nguyen et al., 2021) and educational progression throughout lockdown (Watermeyer et al., 2021). Given the prevalence of dysmorphic concern in students (Veale et al., 2016; Ahamed et al., 2016; Enander et al., 2018; Hakim et al., 2021) and student mental health resources being accessed at high rates (Burns, Dagnall and Holt, 2020; Smith, 2020), it is essential that video calling and its associated behaviours in relation to dysmorphic concern are investigated to further explore Zoom dysmorphia.

Although this study did not support all the hypotheses it proposed, it showed that there is a link between self-focused attention on video calls and dysmorphic concern.

The phenomenon of Zoom dysmorphia is not entirely understood; however, steps can be taken to safeguard the mental

health of students in this regard. With increases of body image concerns in students during lockdown (Flaudias et al., 2020; Vall-Roqué, Andrés and Saldaña, 2021; Tavalacci, Ladner and Déchelotte, 2021a, 2021b), it is vital that any implicating factors that could possibly deteriorate mental wellbeing in this current way of learning are investigated. Preventative measures such as removing self-view and reducing video call duration should be tested and possibly introduced to students to safeguard young people's mental wellbeing while on video calls.

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## Appendix A

## Study Information Form



University  
of Glasgow

School of Psychology

## Information Form

## 1. Study title and Researcher(s) Details

A Zoom into Body Dysmorphia: Investigating the Correlations between Video Calling Behaviours, Duration and Focus on UK Students' Level of Dysmorphic Concern

Maria McGinlay

Student Email: 2390388M@student.gla.ac.uk

## 2. Paragraph inviting them to take part in your research

My name is Maria McGinlay and I am a student at the University of Glasgow. You are being invited to take part in a research study. Before you decide to take part, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Please take time to decide whether or not you wish to take part. Thank you for your interest.

## 3. What is the purpose of the study?

I am aiming to investigate the relationship between body dysmorphia symptoms and video calling behaviour in UK students. There is currently no research into this correlation in the UK with a strictly student sample. These findings will hopefully provide insight into the effect video conferencing has on students' body satisfaction. I am interested in how attentional focus, duration on video calling software such as Zoom and video manipulation behaviours correlates with body dysmorphic concern questionnaire scores.

## 4. Do I have to take part?

Participation in this study is entirely voluntary and you do not need to take part if you do not want to. If you decide to participate in this study but change your mind about completing any section of the experiment, you are free to leave any question unanswered and remove yourself from the study with no questions asked.

## 5. Will my taking part in this study be kept confidential?

Any personal information that you share in this study will be kept confidential. In the write up of this study, I will omit any details that will link your identity to the results. All personal information will be kept on a password protected computer and will not be shared with anyone outside of the research study.

## 6. What will happen to the results of the research study?

The data collected from the Experimentum study will go through multiple stages of analysis to determine if there is a significant relationship between the zoom behaviours and body dysmorphic concern scores. Demographic information will be analysed to test if any variables from this section are affecting the results.

## 7. Who can I contact if I want more information?

If you want to find out more information about the study or if upon completion, you would like to know the results of the study once the paper has been completed, please feel free to contact me through my email address: 2390388m@student.gla.ac.uk

## Appendix B

## Study Consent Form



University  
of Glasgow

School of Psychology

## Consent Form

**Title of Project:** A Zoom into Body Dysmorphia: Investigating the Correlations between Video Calling Behaviours, Duration and Focus on UK Students' Level of Dysmorphic Concern

Name of Researcher (s): Maria McGinlay

If you agree to participate in this study then please read the following statements and sign your name below to indicate your consent.

- I have read the Information Form for participants and so understand the procedures and have been informed about what to expect;

I agree to participate in this study in which I will be asked to complete two questionnaires: The Body Dysmorphic Concern questionnaire and a survey on video calling behaviours (duration, focus and manipulation tactics) on the Experimentum website;

I understand that my participation in this study is voluntary, and that I can withdraw from the study, at any time and for any reason, without having to give a reason to the researcher;

- I understand that I may omit any questions that I would prefer not to answer;
- I understand that my participation in this project is for the purposes of research, and is in no way an evaluation of me as an individual;
- I understand that any information recorded in the investigation will be made and kept anonymous and will remain confidential and no information that identifies me will be made publicly available;
- I understand that I can contact the researcher(s) for this project; by e-mail to receive more information and/or a summary of the anonymised group results.
- I understand that this consent form with my name is being collected for the sole purpose of recording that I have agreed to take part and that it will be destroyed by 1<sup>st</sup> May 2022. Recordings of my responses/data will be kept until May 2022 and no identifying information will be archived for future research and plagiarism checking with the write-up of this project.
- I confirm that I agree to the way my data will be collected and processed, and that data will be stored in a password protected computer in accordance with relevant data protection policies and regulations.

\_\_\_\_\_  
Name of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

## Appendix C

## Experimentum Study Questions

Survey Section	Section Information	Question	Possible Answers
Demographic Information	Please answer the questions below.	Are you currently enrolled at a UK-based university/college?	1:Yes 2:No
		What is your age today, in years?	selectnum: 18 to 24
		What is your gender?	1:Male 2:Female 3:Other
		If you selected "other" to the previous question, what gender would you use to describe yourself?	text: limit 255 characters
		Are you currently diagnosed with body dysmorphic disorder or an eating disorder?	1:Yes 2:No
DCQ	<p>This part of the questionnaire asks you about concerns or dissatisfaction you have with aspects of your appearance or body.</p> <p>Please choose the option for each statement that best applies to you in terms of how you have felt about your appearance OVER THE PAST WEEK, INCLUDING TODAY.</p> <p>In the past week, have you...</p>	Been very concerned about some aspect of your appearance?	0:Not at all  1:Same as most people 2:More than most people 3:Much more than most people
		Considered yourself to be misformed or misshaped in some way (eg. nose / hair skin / sexual organs / overall body build)?	0:Not at all  1:Same as most people 2:More than most people 3:Much more than most people
		Considered your body to be malfunctional in some way (eg. excessive body odour, flatulence, sweating)?	0:Not at all  1:Same as most people 2:More than most people

			3:Much more than most people
		Consulted or felt that you needed to consult a plastic surgeon / dermatologist / endocrinologist / physician etc. about these concerns?	0:Not at all 1:Same as most people 2:More than most people 3:Much more than most people
		Been told by others / doctor that you are normal despite you strongly believing that something is wrong with your appearance or bodily functioning?	0:Not at all 1:Same as most people 2:More than most people 3:Much more than most people
		Spent a lot of time worrying about a defect or problem in your appearance / bodily functioning?	0:Not at all 1:Same as most people 2:More than most people 3:Much more than most people
		Spent a lot of time covering up defects or problems in your appearance / bodily functioning?	0:Not at all 1:Same as most people 2:More than most people 3:Much more than most people
Video Call Purposes	Have you used video-calling apps (like Whatsapp Video, Facetime, Houseparty, Zoom etc.) in the last week, and for what purpose? (please select as many as apply)	Yes - social purposes i.e. calls to family or friends	1:Yes 2:No
		Yes - work-related/education purposes i.e. meetings, client consultation, conferences etc.	1:Yes 2:No
		Yes - other reason	1:Yes 2:No



		No - actively avoiding using video-calling apps	1:Yes 2:No
		No - other reason	1:Yes 2:No
Video Call Behaviours	This section of the study will ask you about video call behaviours.	How much time have you spent on video calls in total (for work or social purposes) per day in the last week?	1:No Time 2:Less than 30 mins 3:30 to 60 mins 4:1-2 hours a day 5:More than 2 hours a day
		When you are using video-calling apps (like Whatsapp Video, Facetime, Houseparty, Zoom etc.), what do you tend to pay most attention to on the screen?	1:Mostly your own face/body 2:Mostly the face/body of the person you are speaking to 3:A combination of your own face and the face of the person you are speaking to 4:Other apps/messages/activities on the phone/computer 5:Not watching the screen at all 6:Unsure
Video Manipulation Behaviours	Please select which (if any) of the following behaviours you frequently engage in when using video-calling apps?	Adjusting the lighting in the room to make the video darker/brighter so that people can't see me as clearly	1:Yes 0:No
		Putting on make-up specifically for the video-call	1:Yes 0:No
		Using a filter on your video to change the way you look	1:Yes 0:No
		Sitting in a particular position to hide "flaws" in your appearance or angling the camera to show your best angle	1:Yes 0:No

## Appendix D

## Study Debrief

## DEBRIEFING SHEET

You participated in the study investigating the relationship between video calling behaviours and body dysmorphic concern scores.

One of the questionnaires collated information about your video calling behaviours.

One question asked about what you focus on when on a video call. I have hypothesised that students who focus on their own face the most will be more likely to have a higher body dysmorphic concern score. This would be reflective of research that shows that those who spend more time looking at their face in the mirror or on their phones are more likely to show body dysmorphic symptoms.

Another question asked about your video manipulation behaviours on video calls. I have hypothesised that use of video manipulation behaviours on video calls will be a significant predictor of dysmorphic concern. I have predicted this outcome due to research showing that people with body dysmorphic symptomology have been shown to alter their appearance in other situations through manipulation tactics such as lighting and applying makeup. It would therefore be logical to assume that video manipulation tactics will show a connection to body dysmorphic concern.

Finally, another question asked about the duration of time you have spent on video calling in the last week. This was to investigate if more time on video calls was related to higher scores on the Body Dysmorphic Concern Questionnaire. A previous study failed to establish this relationship but I rationalised that if a strictly student sample was to participate in this study, a correlation would be made. This is due to young people being susceptible to low self-esteem and body dissatisfaction.

I am aware that body dysmorphia can be a sensitive topic for some to discuss. If you feel that the issues discussed in this study have affected you, please visit the following link for more information about body dysmorphic disorder (BDD) and resources that are available to you if you feel you require more support.

<https://www.nhs.uk/mental-health/conditions/body-dysmorphia/>

If you have any questions feel free to ask the experimenter (Maria McGinlay) by emailing [2390388M@student.gla.ac.uk](mailto:2390388M@student.gla.ac.uk)

Thank you for your participation.