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# Push or pull? Unpacking the social compensation hypothesis of Internet use in an educational context



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## ABSTRACT

Individual differences such as social anxiety and extraversion have been shown to influence education outcomes. However, there has been limited investigation of the relationship between individual differences and attitudes towards online and offline learning. This study aimed to investigate for the first time how social anxiety and extraversion influence student attitudes to online and offline learning, specifically in relation to tertiary level practical activities. Based on the social compensation hypothesis, it was predicted that students with higher levels of extraversion and lower levels of social anxiety would report more favourable attitudes to face-to-face learning activities. It was further predicted that less extraverted and more socially anxious students would have more favourable attitudes to online learning activities. Undergraduate students ( $N = 322$ , 67% female) completed the HEXACO-60 personality inventory, the Mini Social Phobia Inventory, and measures of attitudes towards online and offline activities. Two hierarchical multiple regressions were conducted. The first revealed that neither extraversion nor social anxiety contributed significantly to preference for online practical activities. The second regression revealed that greater emotionality, greater extraversion, greater conscientiousness, and lower levels of social anxiety were associated with more favourable attitudes towards face-to-face practical activities. In contrast to predictions, extraversion and social anxiety did not significantly contribute to attitudes to online learning activities. However, in line with predictions, greater extraversion and lower levels of social anxiety were associated with more favourable attitudes towards face-to-face practical activities. These findings indicate that online learning activities have limited compensatory effects for students who experience social discomfort, and that the social compensation hypothesis may apply within an educational framework, but in unexpected ways.

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## 1. Introduction

Increasing attention is being paid to the influence of individual differences on education outcomes (e.g., Wach, Karbach, Ruffing, Brünken, & Spinath, 2016). However, despite the rapidly changing nature of tertiary education as learning resources and activities are transitioned into online offerings, our understanding of the role of individual differences in learning as a function of online vs. offline learning environments remains limited. This study aimed to address this gap in the literature by

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investigating for the first time how social anxiety and extraversion influence student attitudes to online and offline learning, using established models of Internet use as a theoretical base. It is hoped that the insight offered here will provide valuable information for tertiary educators as they aim to maximise student engagement and experience in an increasingly online world.

Social anxiety (also termed 'social phobia') is characterised by a persistent anxiety in regards to social situations where negative social evaluations from others might occur; a fear that this anxiety or embarrassment will be noticed by others (for example, a shaking voice); and an avoidance of situations where social performance might be required (Diagnostic and Statistical Manual of Mental Disorders, 5th Edition [DSM-5]: [American Psychiatric Association, 2013](#)). Social anxiety can be considered to have two domains; anxiety related to requirements to interact (for example participating in group discussion or answering questions), and anxiety associated with being observed ([Mattick & Clarke, 1998](#)). Thus, social anxiety is not only associated with interaction, but also simply being present in a social setting. These concerns extend beyond shyness, with individuals who have social anxiety often experiencing panic, social isolation, and impaired cognitive processes, such as difficulty in concentrating ([Stein & Stein, 2008](#)). It has also been reported that stressors which contained a socially-evaluative threat elicit stronger negative physiological responses (such as increased cortisol production) than other non-social stressors, and may have long-term repercussions for health ([Dickerson & Kemeny, 2004](#)). Social anxiety is a relatively common disorder, with a lifetime prevalence rate of around 12% ([Ruscio et al., 2008](#)). Of particular concern for educators, social anxiety can affect a substantial proportion of university students, with rates around 10% for mild social anxiety, and 29% for severe social anxiety ([Dell'Osso et al., 2014](#)).

[Dell'Osso et al. \(2014\)](#) also reported that students with mild and severe levels of social anxiety experienced functional impairment at university. For example, difficulties with study-related tasks (working with others, speaking at a meeting) or avoidance behaviours (not expressing disagreement, withdrawal from studies) were reported. Clearly, understanding how best to facilitate learning experiences for students with social anxiety would be a welcome skill for tertiary educators, in terms of both curriculum and learning activity design. The nature of the Internet and eLearning offers some promise in this regard.

The premise that students who experience social discomfort would find online learning activities appealing aligns with the *social compensation hypothesis* of Internet use. The social compensation hypothesis posits that the Internet allows individuals who feel uncomfortable engaging in face-to-face activities a more pleasing alternative (e.g., [Lee, 2009](#); [Weidman et al., 2012](#); [Zywica & Danowski, 2008](#)). The social compensation hypothesis appears to apply to individuals who are more introverted and less sociable in the offline world. According to this hypothesis, these individuals turn to the online environment to compensate for a lack of offline social networks. The preference for online interaction is assumed to be due to the controlled and asynchronous nature of the Internet ([Suler, 2004](#)). For example, a person who experiences a lack of confidence when speaking to others in person may feel more comfortable communicating with others when they can take the time to craft a considered response from the relative safety of their keyboard. Further, concerns in regards to appearance in social situations (such as a fear of blushing when speaking) can be readily avoided in the online environment.

The social compensation hypothesis of Internet use has received substantial support in multiple contexts. [McCord, Rodebaugh, and Levinson \(2014\)](#) found that higher levels of social anxiety were associated with greater social networking site use. [Indian and Grieve \(2014\)](#) found that Facebook-derived social support was associated with greater subjective well-being, but only for individuals with high levels of social anxiety, explaining 11.5% of variance (vs. 3.6% of variance in the low social anxiety group). Other findings supporting the social compensation hypothesis come from studies looking at online chat (e.g., [Desjarlais & Willoughby, 2010](#)) online video game play (e.g., [Kowert, Vogelgesang, Festl, & Quandt, 2015](#)), and instant messaging ([Lundy & Drouin, 2016](#)). Higher levels of social anxiety also predict positive responses to questions such as 'I am worthless offline, but online I am someone' in a sample of massively multiplayer online gamers, with 25.6% of variance explained ([Cole & Hooley, 2013](#)). [Martončík and Lokša \(2016\)](#) found that World of Warcraft players reported significantly less social anxiety in their fictional online world than in the offline world, with 40% of variance in social anxiety explained by world type.

It is well established that the online delivery of learning activities is pedagogically promising, because it is based on a more self-directed and student-centred paradigm, and through encouraging deeper learning (e.g., [Ituma, 2011](#); [Robinson & Hullinger, 2008](#)). Importantly, Ituma found that students thought that online learning activities were a valuable supplement to traditional learning. From a practical perspective, online learning activities offer additional benefits for students, such as ease of access to assessment feedback ([Grieve, Padgett, & Moffitt, 2016](#)), as well as flexibility in terms of when the work is undertaken, allowing students a bespoke timeframe in which to complete learning tasks ([Kemp & Grieve, 2014](#)).

However, to date, no empirical examination of the applicability of the social compensation hypothesis in the context of online and offline learning has been undertaken. Given the prevalence of social anxiety in university students ([Dell'Osso et al., 2014](#)), this omission represents a critical gap in the literature. More information is needed so that educators can take better advantage of the benefits that online delivery of learning activities provides. For example, might more online options make it easier for individuals who feel less confident in traditional, face-to-face learning activities to enjoy their learning experience more? What special considerations might help to enhance curriculum design? Our research sought to address this gap, by explicitly investigating for the first time whether there is evidence to support the social compensation hypothesis in online and offline learning.

### 1.1. The current research

Within our university department, undergraduate units are taught in mixed modalities. These units generally comprise a lecture sequence, as well as a practical activity component. For the unit we examined here, lectures are given in traditional (face-to-face) format (but are also available to be watched online via the unit website), while the practical activities are completed in a mix of traditional and online modalities. Some weeks, the practical activities are conducted face-to-face, led by a tutor (similar to the 'tutorials' run by other institutions). In other weeks, practical activities are "self-directed" learning activities where the students complete the tasks online and at a time and place of their choosing. To ensure that students are doing both types of activities, completion of all practical activities is recorded. Further, a quiz at the end of the semester (worth 10% of the student's final grade) assesses their understanding of practical activity content.

Online and offline activities build on content covered in the lectures, and are designed to provide students with the opportunity to engage with the material in a concrete and direct manner. An example of lecture, online, and offline practical activities for a given topic is presented in Table 1. Practical activities are structured such that the workload, in terms of content and time commitment, is approximately equal across online and offline modalities. The face-to-face practical activities involved a large proportion of social interaction, although some students would have participated to a greater or lesser extent than others. In contrast, none of the online practical activities included any prescribed social interaction (for example, in no activity were students required to participate in video-chat or online discussion forums).

It follows that the practical activity sequence of this unit was ideally placed to allow a direct examination of attitudes towards both online and offline learning modalities, without the potential confounds of needing (for example) to use a sample drawn from two different units, covering two different topics, or from two different time points. This methodology was essential in order to allow the mode of delivery to be adequately assessed.

We took a two-fold approach to test the social compensation hypothesis. Clearly, the inclusion of social anxiety as a variable was warranted. However, mindful of previous findings suggesting that functional impairments can occur for those students who experience milder forms of social discomfort (Dell'Osso et al., 2014), we deemed it prudent to also include extraversion as an additional variable of interest. Extraversion is an aspect of personality characterised by an outgoing nature, the enjoyment of social interactions, and positive self-evaluations (Lee & Ashton, 2008). Extraversion exists on a continuum: individuals with lower extraversion are likely to feel less confident in social interactions and are more likely to experience social awkwardness. Consequently, the lower pole of extraversion offers insight into the experience of individuals who may not have clinical levels of social anxiety, but who nonetheless experiences lesser self-assurance in social situations. Furthermore, there is evidence that higher levels of extraversion may enhance learning in online settings, which may then influence perception of the online experience (Orvis, Brusso, Wasserman, & Fisher, 2010). Thus, the inclusion of extraversion as well as social anxiety allows a more sensitive consideration of individual differences in social propensity.

Note that consistent with current personality research approaches (e.g., Austin & Vahle, 2016)—and in order to account for any potential shared variance between extraversion and the other domains of personality—we included other personality factors for completeness. We chose the HEXACO model approach of personality (assessing honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness) as it offers a parsimonious but effective structure to operationalise personality allowing for examination of factors beyond those traditionally included in Big Five personality approaches (Ashton, Lee, & deVries, 2014). This inclusive approach is in line with existing research that has examined the nexus

**Table 1**  
Sample lecture, online, and offline practical activities for the topic "consciousness: sleep".

Topic: sleep		
Lecture content (delivered in traditional format, also available as an online recording)	Face-to-face practical activity content (completed in student workbook)	Online practical activity content (presented and completed in student workbook)
<ul style="list-style-type: none"> <li>• Neurobiology of sleep</li> <li>• The stages of sleep, and sleep-wake cycles</li> <li>• Sleep research</li> <li>• The nature of dreaming, and theoretical explanations for dreaming</li> <li>• The causes and symptoms of various sleep disorders</li> <li>• Sleep hygiene</li> <li>• The effects of sleep deprivation</li> </ul>	<ul style="list-style-type: none"> <li>• Students complete a 7-day retrospective report on their caffeine intake and number of hours slept per 24 h, guided by their tutor</li> <li>• Students generate a scatterplot based on their data, guided by their tutor</li> <li>• Working in small groups (with tutor assisting and facilitating as necessary), students identify:               <ul style="list-style-type: none"> <li>■ The nature of the relationship between sleep and caffeine as is evident in their scatterplot</li> <li>■ Strengths and weaknesses of this study</li> <li>■ Ways to improve this study</li> </ul> </li> <li>• Tutor leads a class discussion to recap key points and to ensure that all students have grasped key themes</li> </ul>	<p>Students are provided with links to two videos on the case of Peter Trip (<a href="http://www.youtube.com/watch?v=ko9MdrVWvHM">www.youtube.com/watch?v=ko9MdrVWvHM</a> and <a href="http://www.youtube.com/watch?v=2tIsB00Xz4E">www.youtube.com/watch?v=2tIsB00Xz4E</a>) and asked to answer the following questions:</p> <ol style="list-style-type: none"> <li>1 How long does Peter Trip go without sleep for?</li> <li>2 What symptoms/unusual behaviour did Peter display during the sleep deprivation?</li> <li>3 What unusual physiological events occurred during the sleep deprivation?</li> <li>4 What symptoms/unusual behaviour did Peter display after the sleep deprivation?</li> <li>5 The professionals express concern about the 'experiment', and are reluctant to be involved, but decide to get involved on the basis that Peter Trip plans to go ahead regardless. Do you think it was professionally ethical for them to get involved, or not? Justify your answer.</li> </ol>

between personality and online interaction (e.g., Grieve & Kemp, 2015), while also allowing any overlapping variance between elements of personality to be accounted for within the model (Tabachnick & Fidell, 2007).

### 1.1.1. Hypotheses

Based on the social compensation hypothesis, it was predicted that students with higher levels of extraversion and lower levels of social anxiety would report more favourable attitudes to face-to-face learning activities. It was further predicted that less extraverted and more socially anxious students would have more favourable attitudes to online learning activities.

## 2. Method

Undergraduate university students ( $N = 322$ , 67% female) in their second semester of study at an Australian University were invited to contribute their data from an anonymous, online class exercise on personality. Completion of all practical activities is compulsory, thus all participants had completed both online and offline activities prior to data collection. The data were collected between weeks 6 and 8 of a 13-week semester. The mean age of the sample was 23.40 years ( $SD = 8.14$ , range = 18–65 years). A variety of discipline majors was evident: students were enrolled in Behavioural Science, Psychology, Arts, Law, and Science degrees at the Bachelor level.

After giving consent, participants completed the measures. Firstly, the HEXACO-60 (Ashton & Lee, 2009) personality inventory was administered. This 60-item measure assesses six domains of personality: honesty-humility (sample item: 'I wouldn't pretend to like someone just to get that person to do favours for me'), emotionality ('I sometimes can't help worrying about little things'), extraversion ('I prefer jobs that involve active social interaction to those that involve working alone'), agreeableness ('Even when people make a lot of mistakes, I rarely say anything negative'), conscientiousness ('I often push myself very hard when trying to achieve a goal'), and openness to experience ('I like people who have unconventional views'). Participants indicate their level of agreement with 10 statements for each personality domain using a five-point Likert-style scale with the anchors 1 = strongly disagree and 5 = strongly agree. Some items are reversed to limit the effect of potential response bias.

Social anxiety was measured using the Mini Social Phobia Inventory (Mini-SPIN; Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001). The Mini-SPIN comprises 3 items and is an effective screening tool for social anxiety (Connor et al.; Weeks, Spokas, & Heimberg, 2007) with validated score cut-offs that indicate a provisional diagnosis of social anxiety disorder. Items ask participants to report on their experiences reflecting social anxiety (such as "Fear of embarrassment causes me to avoid doing things or speaking to people") with anchors 0 = not at all; 1 = a little bit; 2 = somewhat; 3 = very much; and 4 = extremely.

Attitudes towards online and offline activities were then assessed. Drawing on existing research that has investigated attitudes towards online and offline learning activities (e.g., Grieve et al., 2016; Moss, Hamilton, White, & Hansen, 2015), we developed semantic differential items to assess attitudes to face-to-face practical activities, as well as to online ("self-directed") practical activities. For example, participants were asked to endorse the extent to which "For me, having face-to-face practicals is good ... .. bad". The other semantic differentials were pleasant/unpleasant, difficult/easy, and unfavourable/favourable; thus four items assessed attitudes to face-to-face practical activities. Four additional items (using the semantic differential anchors noted above) assessed attitudes to online practical activities (e.g., "For me, having online practicals is good ... .. bad"). Some items were reverse-scored as was appropriate, such that higher scores reflected more positive attitudes to that learning activity delivery mode. Semantic differential items are an effective way to operationalise attitudes towards a topic (Ajzen, 1991).

### 2.1. Design and data analysis

This was a cross-sectional, correlational design. Two hierarchical multiple regressions addressed the hypotheses. For the first hierarchical multiple regression, the outcome variable was attitudes towards face-to-face practical activities. For the second hierarchical multiple regression, the outcome variable was attitudes towards online practical activities. For both hierarchical multiple regressions, the personality predictors were entered in the first step (honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience), with the additional contribution of social anxiety examined via its inclusion at step two.

## 3. Results

All relevant statistical assumptions were met, and no multicollinearity was present. Descriptive statistics are presented in Table 2, and show that our sample reported similar personality scores as seen in previous research (Ashton & Lee, 2009; Austin & Vahle, 2016; Grieve, 2012) suggesting that our sample was representative. Scale reliabilities were assessed using Cronbach's alpha and are also presented in Table 2. For the attitude measures, internal reliabilities were very good. The personality subscales had weaker internal reliability, although these were still at acceptable levels and were consistent with other research that has also used the HEXACO-60 (e.g., Ashton & Lee, 2009; Austin & Vahle, 2016; Grieve, 2012). There were no significant differences as a function of gender in attitudes to either face-to-face or online practicals ( $p = 0.57$  and  $p = 0.93$ , respectively), and thus we deemed it appropriate to analyse data from females and males together.

**Table 2**  
Descriptive statistics and internal reliabilities for attitudes towards practical activities, personality, and social anxiety.

	Mean	Standard Deviation	Possible Range <sup>a</sup>	Cronbach's Alpha
Attitudes to online practical activities	3.24	1.14	1–5	0.88
Attitudes to offline practical activities	3.91	0.87	1–5	0.82
Honesty-Humility	3.47	0.59	1–5	0.71
Emotionality	3.21	0.59	1–5	0.75
Extraversion	3.19	0.64	1–5	0.81
Agreeableness	3.20	0.55	1–5	0.72
Conscientiousness	3.40	0.60	1–5	0.78
Open to experience	3.35	0.69	1–5	0.81
Social anxiety	2.60	1.02	0–4	0.80

Note. <sup>a</sup> see method section for details of anchors for each measure.

At the mean level, the sample experienced social anxiety at similar levels to those seen in previous research (e.g., [Indian & Grieve, 2014](#)), with substantial variance as implied by the standard deviation. The histogram revealed a relatively normal distribution (though skewness statistics indicated a slight positive skew), with scores along all possible values. Of note, 36.3% of students had a score of six or more on the MiniSPIN, which is indicative of a provisional diagnosis of social anxiety in clinical populations ([Fogliati et al., 2016](#); [Weeks et al., 2007](#)) and provides good discrimination of individuals with and without anxiety disorder in general populations ([Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001](#)). As such, our findings are very similar to those of [Dell'Osso et al. \(2014\)](#), who found that 38.6% of a sample of 717 university students experienced medium to high levels of social anxiety on the Social Anxiety Spectrum Self-Report questionnaire (SHY-SR, [Dell'Osso et al., 2002](#)). Together, these indicate that the current sample comprised individuals with sufficient levels of social anxiety such that the effects of social anxiety, if any, should be able to emerge.

On average, the students reported more favourable attitudes to face-to-face practicals than to online practicals, and this difference was statistically significant,  $t(321) = -7.85, p < 0.001$ , which was a medium effect (Cohen's  $d = 0.65$ ; [Cohen, 1992](#)). Also, there was a negative correlation between attitudes towards face-to-face practicals and online practicals,  $r(320) = -0.15, p < 0.01$ . The full correlation matrix is presented in [Table 3](#).

There was also a significant interaction between social anxiety and attitudes to practical activity type,  $F(1,322) = 5.53, p = 0.019$  (partial  $\eta^2 = 0.017$ ), indicating that attitudes to practical activities differed as a function of social anxiety. Specifically, individuals with lower levels of social anxiety reported more positive attitudes towards face-to-face practicals, as presented in [Fig. 1](#).

### 3.1. Attitudes to online practicals

A hierarchical multiple regression was conducted to identify the predictors of attitudes to online practicals. Details of the analysis can be seen in [Table 4](#). In step one, the combination of personality variables (honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience) explained only 1.7% of variance in attitudes towards online practicals,  $R = 0.132$ . This was not significant,  $F(6,315) = 0.93, p = 0.48$ . The addition of social anxiety into the model at step two explained an additional 0.001% of variance: this was not a significant improvement,  $Fchange(1,314) = 0.07, p = 0.79$ . The overall model explained 0.018% of variance ( $R = 0.033$ ), and was not statistically significant,  $F(7,314) = 0.80, p = 0.59$ . There were no significant predictors within the model. Effect sizes for both models were very small, at  $f^2 = 0.017$  and  $f^2 = 0.018$  for step one and step two of the hierarchical regression respectively (interpreted in line with [Cohen, 1992](#)).

**Table 3**  
Bivariate correlations between personality, social anxiety, and attitude variables.

	Attitudes to online practical activities	Attitudes to offline practical activities	Honesty-humility	Emotionality	Extraversion	Agreeableness	Conscientiousness	Openness to experience	Social anxiety
Attitudes to online practical activities	1.00	-0.15**	-0.06	0.03	-0.09	-0.07	0.02	-0.01	0.03
Attitudes to offline practical activities		1.00	0.18 <sup>a</sup>	0.06	0.29***	0.11	0.24***	0.17**	0.25***
Honesty-Humility			1.00	0.08	0.02	0.28***	0.23***	0.21***	0.02
Emotionality				1.00	-0.16**	0.08	0.13*	-0.16**	0.32***
Extraversion					1.00	0.12*	0.26***	0.20***	-0.55***
Agreeableness						1.00	-0.02	0.07	0.07
Conscientiousness							1.00	0.13*	-0.15**
Openness to experience								1.00	-0.13*
Social anxiety									1.00

Note. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

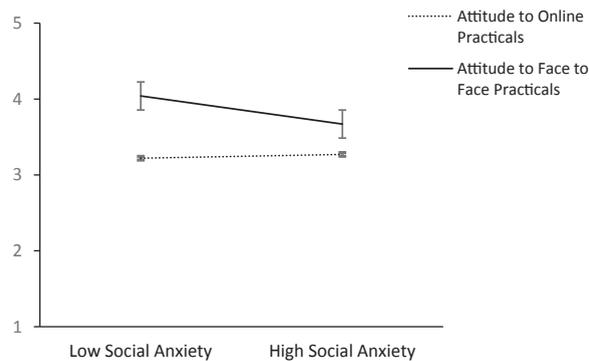


Fig. 1. Means and standard errors for attitudes towards online and face to face practicals for high versus low social anxiety groups.

Table 4

Personality and social anxiety in relation to online learning attitudes.

	B	SE	Beta	t statistic	p value
Step 1					
Constant	15.73	2.87		5.48	
Honesty-Humility	-0.05	0.05	-0.06	-1.01	0.31
Emotionality	0.01	0.05	0.02	0.27	0.79
Extraversion	-0.04	0.04	-0.10	-1.66	0.10
Agreeableness	-0.04	0.05	-0.05	-0.76	0.45
Conscientiousness	0.04	0.05	0.06	0.92	0.36
Openness to Experience	0.02	0.04	0.03	0.42	0.68
Step 2					
Constant	16.03	3.10		5.19	
Honesty-Humility	-0.05	0.05	-0.06	-1.01	0.31
Emotionality	0.02	0.05	0.02	0.33	0.74
Extraversion	-0.08	0.05	-0.11	-1.56	0.12
Agreeableness	-0.04	0.05	-0.04	-0.71	0.48
Conscientiousness	0.04	0.05	0.06	0.91	0.37
Openness to Experience	0.02	0.04	0.03	0.42	0.68
Social Anxiety	-0.03	0.12	-0.02	-0.26	0.79

### 3.2. Attitudes to face-to-face practicals

In step one, the combination of personality variables accounted for 14.6% of variance in attitudes to face-to-face practicals,  $R = 0.38$ , and this was a statistically significant model,  $F(6,315) = 8.97$ ,  $p < 0.001$ . Within the model, greater levels of extraversion and conscientiousness significantly predicted more favourable attitudes towards face-to-face practicals. In step two, social anxiety was added to the model. This significantly improved the model,  $Fchange(1,314) = 8.44$ ,  $p = 0.004$ . The final model explained 16.8% of variance in attitudes towards face-to-face practical classes, and was statistically significant,  $F(7,314) = 9.08$ ,  $p < 0.001$ . Within the model, there were several significant individual predictors. Specifically, greater emotionality, greater extraversion, greater conscientiousness, and lower levels of social anxiety were associated with more favourable attitudes towards face-to-face practical activities. The full regression is presented in Table 5.

## 4. Discussion

The aim of this study was to provide the first empirical evidence investigating the utility of the social compensation hypothesis within the context of online and offline learning activities. In contrast to predictions, neither personality (specifically, extraversion) nor social anxiety significantly contributed to attitudes to online learning activities. However, in line with predictions, greater extraversion and lower levels of social anxiety were associated with more favourable attitudes towards face-to-face practical activities. In addition, greater emotionality and greater conscientiousness also significantly predicted attitudes to face-to-face learning activities. Social anxiety explained significant additional variance in attitudes to face-to-face learning activities, but not online learning activities.

**Table 5**  
Personality and social anxiety in relation to face-to-face learning attitudes.

	B	SE	Beta	t statistic	p value
Step 1					
Constant	2.70	2.03		1.33	
Honesty-Humility	0.06	0.03	0.11	1.84	0.07
Emotionality	0.05	0.03	0.09	1.58	0.12
Extraversion	0.13	0.03	0.24	4.24	<0.001
Agreeableness	0.03	0.04	0.04	0.70	0.48
Conscientiousness	0.08	0.03	0.13	2.34	0.02
Openness to Experience	0.05	0.03	0.10	1.74	0.08
Step 2					
Constant	4.97	2.15		2.311	
Honesty-Humility	0.06	0.03	0.10	1.80	0.07
Emotionality	0.08	0.03	0.13	2.32	0.02
Extraversion	0.08	0.04	0.14	2.18	0.03
Agreeableness	0.04	0.04	0.06	1.12	0.27
Conscientiousness	0.07	0.03	0.13	2.26	0.03
Openness to Experience	0.05	0.03	0.10	1.80	0.07
Social Anxiety	-0.22	0.08	-0.19	-2.91	0.004

#### 4.1. Towards a dual model of social compensation in online and face-to-face learning contexts?

The social compensation hypothesis of Internet use proposes that the online world provides an alternative means by which individuals lacking social confidence can engage (e.g., Zywicka & Danowski, 2008). This is because the online world can be less confrontational or pressured than the offline world, especially for people who may experience a lack of confidence in face-to-face interactions. For example, the shy or socially anxious may find that they have a strong preference for online, rather than face-to-face interactions. Therefore, the lack of significant effects of extraversion and social anxiety on attitudes to online learning activities seen in our data contradicts the social compensation paradigm. Students who were more introverted and more socially anxious did not report more positive attitudes towards online learning activities. Based on the current data, there is therefore no evidence that social inhibition influences attitudes towards online learning.

However, our data also suggest that some elements of the social compensation hypothesis do in fact apply. Specifically, variables reflecting lower levels of social confidence (low extraversion and high social anxiety) and less conscientiousness were associated with less favourable attitudes towards face-to-face learning activities. Thus, our introverted and more social anxious students feel negatively towards in-person interaction in learning activities.

Empirically testing the relevance of the social compensation hypothesis allows greater insight at both theoretical and applied levels. At a theoretical level, this research allows the social compensation paradigm to be examined for the first time in the educational context. Our findings suggest that the social compensation hypothesis does apply in an educational framework, but in unexpected ways. Low extraversion and heightened social anxiety seem to drive the pull away from face-to-face interaction, rather than a push towards online learning activities.

If the emphasis, then, is on the pull away from face-to-face interaction, rather than towards online interaction, then perhaps the social compensation hypotheses needs to be reframed for use within educational contexts, in order to more clearly articulate its potentially dual nature. For example, a clearer acknowledgement that the online learning space allows for an alternative, rather than compensative, means by which socially anxious and more introverted students can engage with learning activities is indicated.

There are several potential explanations as to the constrained utility of the social compensation hypothesis in regards to online learning. Perhaps it may simply be that as online learning activities are less social than online social networking, there is little scope for what is essentially a social hypothesis to have an effect. However, it must also be noted that the nature of Internet use is increasingly ubiquitous, with individuals entering the online environment “anytime, anyplace, anywhere” (Quinn & Oldmeadow, 2013, p. 238). The social compensation hypothesis is predicated on a clear delineation between the online and offline worlds, yet this demarcation may no longer be well defined. Specifically, the evolution of the online learning environment means that it is now contains more social interaction (for example real-time group discussions using web-cameras), and thus online learning activities may be perceived as socially threatening. Indeed, there is evidence that socially anxious male gamers have heightened arousal (both in terms of negative affect and increased cortisol) when engaging in team-based games, and it has been proposed that this response may reduce learning in the online environment (Brom et al., 2014). Kothgassner et al. (2016) have also reported that speaking publicly in virtual and real environments elicits similar anxiety responses. Given that online learning is rapidly developing to include more socially interactive tasks, it seems likely that Internet-mediated activities no longer provide the sanctuary for individuals who may not be comfortable interacting face-to-face.

Conscientiousness was positively associated with favourable attitudes towards face-to-face learning activities. Individuals with high levels of conscientiousness are organised, diligent, and thorough (Ashton & Lee, 2007). Although not a prediction of the current study, it is therefore certainly feasible (if not likely) that more conscientious students (who are presumably better

prepared and more involved in their studies than less conscientious students) would enjoy the interaction and engagement that face-to-face learning activities afford, resulting in positive attitudes to the face-to-face learning modality.

High emotionality is associated with feelings of apprehension and emotional vulnerability (Ashton & Lee, 2007). An unexpected finding was that once social anxiety was included in the multivariate model, greater emotionality was also associated with more favourable attitudes towards face-to-face learning activities. However, it is important to interpret this finding carefully. Specifically, emotionality has a small and non-significant bivariate relationship with attitudes to face-to-face learning activities (as presented in Table 3), suggesting that it is acting as a statistical suppressor within the multivariate model (see Conger, 1974). As such, endorsement of emotionally laden personality items contributes to the overall model by accounting for extraneous variance in social anxiety, rather than by directly predicting attitudes to face-to-face learning activities.

In addition to the theoretical implications stemming from this study as noted above, there are also practical implications for educators. Specifically, our data indicate that the recognition of individual differences is vital within the context of truly student-centred learning. Thus, our findings build and extend upon other research that identifies the importance of personalised learning and assessment (Wanner & Palmer, 2015), by revealing that individual differences can also play a role in formation of the cohesive learning experience. As access to and engagement with technology as part of the educational milieu increases, educators can use this knowledge to enhance opportunities to encourage a bespoke approach to learning activities. For example, considering a student's level of extraversion would allow educators to more effectively tailor blended learning activities, in order to maximise the accessibility of the learning experience.

Further, there are implications for higher education policy makers. As university student services continue to increase their focus on student enjoyment and engagement, understanding how individual differences such as personality and social anxiety can impact student attitudes towards learning activities can inform programs that might boost student motivation and enhance student retention and success. Within the rapidly evolving higher education context, and mindful that many courses are transferring to blended or online delivery, our data shows that because of individual differences, not all learning activities are "created equal" for individual students.

The current findings also highlight the potential influence of characteristics such as social anxiety on the student learning experience. Given the prevalence of social anxiety (Brook & Willoughby, 2016; Campbell, Bierman, & Molenaar, 2016; Dell'Osso et al., 2014; Russell & Shaw, 2009), and fear of public speaking (Marinho, de Medeiros, Gama, & Teixeira, 2017) in university students, understanding the role that social anxiety can play for students is highly relevant. Within teaching settings, we recommend that educators consider options to reduce social performance demands when designing learning activities. Learning activities that allow students to build their self-confidence and social self-efficacy in gradual and low-stakes activities are indicated. This could take the form of cooperative (rather than competitive) small group activities that foster positive interdependence (e.g., Johnson, Johnson, & Smith, 2013). Online discussion activities in which students are asked to share their thoughts and concerns about face-to-face activities might allow such concerns to be allayed. Having those discussions moderated by tutors, or by students who had previously completed the unit, could show a coping model (by the tutors acknowledging the difficulties that they experienced but overcame). This model could be further facilitated by strong observer-model similarity (that is, student-to-student or student-to-tutor rather than student-to-lecturer observation) to enhance social learning (Schunk, 1998). Incorporating self-directed modules that draw awareness to the malleable nature of shyness and social phobia (see Henderson, Gilbert, & Zimbardo, 2014), and then comprise topics on effective communication and interpersonal skills could also prove useful. As a corollary, this would also boost workplace readiness). Such modules could be embedded in introductory units, running alongside core content areas for a particular unit, or could be run as separate university preparation and professional development modules. Of course, appropriate training and mentorship of staff involved in all of these initiatives would be essential, given the complexities of social anxiety in the higher education context (Topham & Russell, 2012).

More broadly, our results add weight to extant views noting that students with a high level of social anxiety sit "uncomfortably between pedagogic and psychological perspectives" (Topham & Russell, 2012, p. 283). However, there are numerous successful treatments for social anxiety disorder (for example cognitive behavioural therapy; Acarturk, Cuijpers, van Straten, & de Graaf, 2009) that can be readily delivered in university-based counselling or psychology clinics. Our data therefore provide further support for the importance of pastoral care provision in higher education, and we advocate for students to be made aware of the supports that are available, as assistance will likely be valuable for those who are experiencing social anxiety.

#### 4.2. Additional considerations

It should be noted that in this study we focused purely on attitudes towards learning activities, rather than achievement based on those activities. This is both a limitation and a strength of the current study. It is important not to automatically extrapolate our findings to suggest that social compensation effects might influence student performance.<sup>1</sup> However, our study solidly supports the notion that individual differences do fundamentally influence student attitudes towards learning activities as a function of delivery medium. If certain students have more favourable attitudes regarding learning activities

<sup>1</sup> Indeed, Kemp and Grieve (2014) identified that student preference for a modality (online or Face-to-Face) was not associated with overall performance.

that occur in a particular context, it is reasonable to assume that they are also likely to be more engaged in those learning activities. As it is known that greater engagement is associated with better learning outcomes (e.g., Goggins & Xing, 2016; Phan, McNeil, & Robin, 2016), then it follows that for some students, the medium in which learning activities are delivered may have a substantial impact.

Although the online and offline learning activities considered in this unit were designed to be similar in terms of complexity and quality, it is possible that students viewed one type of activity as being more demanding or interesting, thus influencing their attitudes towards that modality. Future research could consider including explicit measures of perceived effort related to the learning tasks in both online and offline environments, in order to examine this idea.

This research was also conducted only at one university, and with one cohort of students. We advocate that additional research be undertaken at other institutions to examine the generalizability of the current findings. Future research might also benefit from including a qualitative component in order to identify which aspects of online and face-to-face learning activities are central to the formation of students' attitudes towards those activities, as a function of levels of extraversion and social anxiety.

### 4.3. Concluding comments

Our findings highlight that identification of individual differences might enhance student-centred approaches when developing learning activities, but also more broadly within curriculum design and review at policy level. The data seen here suggest that online learning activities have limited compensatory effects for students who experience social discomfort, and indicate that the application of the social compensation hypothesis of Internet use within higher education settings is complex. Educators should be mindful that including activities that ameliorate anxiety about social performance might afford some students a more flexible approach to their learning experiences, allowing them to make the most of blended learning opportunities.

## References

- Acarturk, C., Cuijpers, P., van Straten, A., & de Graaf, R. (2009). Psychological treatment of social anxiety disorder: A meta-analysis. *Psychological Medicine*, 39, 241–254. <http://dx.doi.org/10.1017/S0033291708003590>.
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington: American Psychiatric Publishing.
- Ashton, M. C., & Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO model of personality structure. *Personality and Social Psychology Review*, 11(2), 150–166. <http://dx.doi.org/10.1177/1088868306294907>.
- Ashton, M. C., & Lee, K. (2009). The HEXACO-60: A short measure of the major dimensions of personality. *Journal of Personality Assessment*, 91, 340–345. <http://dx.doi.org/10.1080/00223890902935878>.
- Ashton, M. C., Lee, K., & deVries, R. E. (2014). The HEXACO honesty-humility, agreeableness, and emotionality factors: A review of research and theory. *Personality and Social Psychology Review*, 18(2), 139–152. <http://dx.doi.org/10.1177/1088868314523838>.
- Austin, E. J., & Vahle, N. (2016). Associations of the Managing the Emotions of Others Scale (MEOS) with HEXACO personality and with trait emotional intelligence at the factor and facet level. *Personality and Individual Differences*, 94, 348–353. <http://dx.doi.org/10.1016/j.paid.2016.01.047>.
- Brom, C., Buchtová, M., Sisler, V., Dechtereňko, F., Palme, R., & Glenk, L. M. (2014). Flow, social interaction anxiety and salivary cortisol responses in serious games: A quasi-experimental study. *Computers & Education*, 79, 69–100. <http://dx.doi.org/10.1016/j.compedu.2014.07.001>.
- Brook, C. A., & Willoughby, T. (2016). Social anxiety and alcohol use across the university years: Adaptive and maladaptive groups. *Developmental Psychology*, 52, 835–845. <http://dx.doi.org/10.1037/dev0000110>.
- Campbell, C. G., Bierman, K. L., & Molenaar, P. C. M. (2016). Individual day-to-day process of social anxiety in vulnerable college students. *Applied Developmental Science*, 20, 1–15. <http://dx.doi.org/10.1080/10888691.2015.1026594>.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155–159. <http://dx.doi.org/10.1037/0033-2909.112.1.155>.
- Cole, S. H., & Hooley, J. M. (2013). Clinical and personality correlates of MMO Gaming: Anxiety and absorption in problematic internet use. *Social Science Computer Review*, 31(4), 424–436. <http://dx.doi.org/10.1177/0894439312475280>.
- Conger, A. J. (1974). A revised definition for suppressor variables: A guide to their identification and interpretation. *Educational and Psychological Measurement*, 34, 35–46.
- Connor, K. M., Kobak, K. A., Churchill, L. E., Katzelnick, D., & Davidson, J. R. T. (2001). Mini-SPIN: A brief screening assessment for generalised social anxiety disorder. *Depression and Anxiety*, 14, 137–140. <http://dx.doi.org/10.1002/da.1055>.
- Dell'Osso, L., Abelli, M., Pini, S., Carlini, M., Carpita, B., Macchi, E., et al. (2014). Dimensional assessment of DSM-5 social anxiety symptoms among university students and its relationship with functional impairment. *Neuropsychiatric Disease and Treatment*, 10, 1325–1332. <http://dx.doi.org/10.2147/NDT.S59348>.
- Dell'Osso, L., Rucci, P., Cassano, G. B., Maser, J., Endicott, J., Shear, M. K., et al. (2002). Measuring social phobia and obsessive-compulsive spectrum disorders: Comparison of interviews and self-report instruments. *Comprehensive Psychiatry: The Journal of Psychopathology*, 42, 81–86. <http://dx.doi.org/10.1053/comp.2002.30795>.
- Desjarlais, M., & Willoughby, T. (2010). A longitudinal study of the relation between adolescent boys' and girls' computer use with friends and friendship quality: Support for the social compensation or the rich-get-richer hypothesis? *Computers in Human Behavior*, 26, 896–905. <http://dx.doi.org/10.1016/j.chb.2010.02.004>.
- Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, 130, 355–391. doi: 0.1037/0033-2909.130.3.355.
- Fogliati, V. F., Terides, M. D., Gandy, M., Staples, L. G., Johnston, L., Karin, E., et al. (2016). Psychometric properties of the Mini-Social Phobia Inventory (Mini-SPIN) in a large online treatment-seeking sample. *Cognitive Behaviour Therapy*, 45, 236–257. <http://dx.doi.org/10.1080/16506073.2016.1158206>.
- Goggins, S., & Xing, W. (2016). Building models explaining student participation behaviour in asynchronous online discussion. *Computers & Education*, 94, 241–251. <http://dx.doi.org/10.1016/j.compedu.2015.11.002>.
- Grieve, R. (2012). The role of personality, psychopathy, and previous experience with assessment in intentions to fake in psychological testing. *Current Psychology*, 31, 414–422. <http://dx.doi.org/10.1007/s12144-012-9158-x>.
- Grieve, R., & Kemp, N. (2015). Individual differences predicting social connectedness derived from Facebook: Some unexpected findings. *Computers in Human Behavior*, 51, 239–243. <http://dx.doi.org/10.1016/j.chb.2015.04.034>.

- Grieve, R., Padgett, C., & Moffitt, R. (2016). Assignments 2.0: The role of social presence and computer attitudes in student preferences for online versus offline marking. *The Internet and Higher Education*, 28, 8–16. <http://dx.doi.org/10.1016/j.ineduc.2015.08.002>.
- Henderson, L., Gilbert, P., & Zimbardo, P. (2014). Shyness, social anxiety, and social phobia. In S. G. Hofmann, & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (3rd ed.). Amsterdam: Elsevier.
- Indian, M., & Grieve, R. (2014). When Facebook is easier than face-to-face: Social support derived from Facebook in socially anxious individuals. *Personality and Individual Differences*, 59, 102–106. <http://dx.doi.org/10.1016/j.paid.2013.11.016>.
- Ituma, A. (2011). An evaluation of students' perceptions and engagement with e-learning components in a campus based university. *Active Learning in Higher Education*, 12, 57–68. <http://dx.doi.org/10.1177/1469787410387722>.
- Johnson, D. W., Johnson, R. T., & Smith, K. (2013). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in University Teaching*, 25(4), e1–e26.
- Kemp, N., & Grieve, R. (2014). Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning. *Frontiers in Psychology*, 5, 1278. <http://dx.doi.org/10.3389/fpsyg.2014.012>.
- Kothgassner, O. D., Felnhofer, A., Hlavacs, H., Beutl, L., Palme, R., Kryspin-Exner, I., et al. (2016). Salivary cortisol and cardiovascular reactivity to a public speaking task in a virtual and real-life environment. *Computers in Human Behavior*, 62, 124–135. <http://dx.doi.org/10.1016/j.chb.2016.03.081>.
- Kowert, R., Vogelgesang, J., Festl, R., & Quandt, T. (2015). Psychosocial causes and consequences of online video game play. *Computers in Human Behaviour*, 45, 51–58. <http://dx.doi.org/10.1016/j.chb.2014.11.074>.
- Lee, S. K. (2009). Online communication and adolescent social ties: Who benefits more from Internet use? *Journal of Computer-Mediated Communication*, 14, 509–531. <http://dx.doi.org/10.1111/j.1083-6101.2009.01451.x>.
- Lee, K., & Ashton, M. C. (2008). The HEXACO personality factors in the indigenous personality lexicons of English and 11 other languages. *Journal of Personality*, 76, 1001–1053.
- Lundy, B. L., & Drouin, M. (2016). From social anxiety to interpersonal connectedness: Relationship building within face-to-face, phone, and instant messaging mediums. *Computers in Human Behavior*, 54, 271–277. <http://dx.doi.org/10.1016/j.chb.2015.08.004>.
- Marinho, A. C. F., de Medeiros, A. M., Gama, A. C. C., & Teixeira, L. C. (2017). Fear of public speaking: Perception of college students and correlates. *Journal of Voice*, 31(1), e7–e11. <http://dx.doi.org/10.1016/j.voice.2015.12.012>.
- Martoncik, M., & Lokša, J. (2016). Do World of Warcraft (MMORPG) players experience less loneliness and social anxiety in online world (virtual environment) than in real world (offline)? *Computers in Human Behavior*, 56, 127–134. <http://dx.doi.org/10.1016/j.chb.2015.11.035>.
- Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy*, 36, 455–470.
- McCord, B., Rodebaugh, T. L., & Levinson, C. A. (2014). Facebook: Social uses and anxiety. *Computers in Human Behavior*, 34, 23–27. <http://dx.doi.org/10.1016/j.chb.2014.01.020>.
- Moss, N. D., Hamilton, K., White, K. M., & Hansen, J. (2015). The changing motivations of students' use of lecture podcasts across a semester: An extended theory of planned behaviour approach. *Innovations in Education and Teaching International*, 52(6), 599–609. doi: 10.1080/14703297.2012.756512.
- Orvis, K. A., Brusso, R. C., Wasserman, M. E., & Fisher, S. L. (2010). E-nabled for e-learning? The moderating role of personality in determining the optimal degree of learner control in an e-learning environment. *Human Performance*, 24(1), 60–78. <http://dx.doi.org/10.1080/08959285.2010.530633>.
- Phan, T., McNeil, S. G., & Robin, B. R. (2016). Students' patterns of engagement and course performance in a massive open online course. *Computers & Education*, 95, 36–44. <http://dx.doi.org/10.1016/j.compedu.2015.11.015>.
- Quinn, S., & Oldmeadow, J. (2013). The Martini effect and social networking sites: Early adolescents, mobile social networking, and connectedness to friends. *Mobile Media and Communication*, 1(2), 237–247.
- Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business*, 84, 101–109. <http://dx.doi.org/10.3200/JOEB.84.2.101-109>.
- Ruscio, A. M., Brown, T. A., Chiu, W. T., Sareen, J., Stein, M. B., & Kessler, R. C. (2008). Social fears and social phobia in the USA: Results from the national comorbidity survey replication. *Psychological Medicine*, 38, 15–28. <http://dx.doi.org/10.1079/S0033291707001699>.
- Russell, G. C., & Shaw, S. (2009). A study to investigate the prevalence of social anxiety in a sample of higher education students in the UK. *Journal of Mental Health*, 18(3), 198–206.
- Schunk, D. H. (1998). Teaching elementary students to self-regulate practice of mathematical skills with modeling. In D. H. Schunk, & B. J. Zimmerman (Eds.), *Self-regulated learning, from teaching to self-reflective practice* (pp. 137–159). New York: Guilford Press.
- Stein, M. B., & Stein, D. J. (2008). Social anxiety disorder. *The Lancet*, 29, 1115–1125. [http://dx.doi.org/10.1016/S0140-6736\(08\)60488-2](http://dx.doi.org/10.1016/S0140-6736(08)60488-2).
- Suler, J. (2004). The online disinhibition effect. *Cyberpsychology & Behavior*, 7, 321–326. <http://dx.doi.org/10.1089/1094931041291295>.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5<sup>th</sup> ed.). Boston: Pearson.
- Topham, P., & Russell, G. (2012). Social anxiety in higher education. *The Psychologist*, 25, 280–283.
- Wach, F. S., Karbach, J., Ruffing, S., Brünken, R., & Spinath, F. (2016). University students' satisfaction with their academic studies: Personality and motivation matter. *Frontiers in Psychology*, 7, 55. <http://dx.doi.org/10.3389/fpsyg.2016.00055>.
- Wanner, T., & Palmer, E. (2015). Personalising learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course. *Computers & Education*, 88, 354–369. <http://dx.doi.org/10.1016/j.compedu.2015.07.008>.
- Weeks, J. W., Spokas, M. E., & Heimberg, R. G. (2007). Psychometric evaluation of the mini-social phobia inventory (Mini-SPIN) in a treatment seeking sample. *Depression and Anxiety*, 24, 382–391. <http://dx.doi.org/10.1002/da.20250>.
- Weidman, A. C., Fernandez, K. C., Levinson, C. A., Augustine, A. A., Larsen, R. J., & Rodebaugh, T. L. (2012). Compensatory internet use among individuals higher in social anxiety and its implications for well-being. *Personality and Individual Differences*, 53, 191–195. <http://dx.doi.org/10.1016/j.paid.2012.03.003>.
- Zywica, J., & Danowski, J. (2008). The faces of Facebookers: Investigating social enhancement and social compensation hypotheses; predicting Facebook and offline popularity from sociability and self-esteem, and mapping the meanings of popularity with semantic networks. *Journal of Computer-Mediated Communication*, 14, 1–34. <http://dx.doi.org/10.1111/j.1083-6101.2008.01>.