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Reduced willingness to approach genuine smilers in social anxiety explained by potential for social evaluation, not misperception of smile authenticity

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Abstract

We investigate perception of, and responses to, facial expression authenticity for the first time in social anxiety, testing genuine and polite smiles. Experiment 1 ($N=141$) found perception of smile authenticity was unaffected, but that approach ratings, which are known to be reduced in social anxiety for happy faces, are more strongly reduced for genuine than polite smiles. Moreover, we found an independent contribution of social anxiety to approach ratings, over and above general negative affect (state/trait anxiety, depression), *only* for genuine smiles, and not for polite ones. We argue this pattern of results can be explained by genuine smilers signaling greater potential for interaction—and thus greater potential for the scrutiny that is feared in social anxiety—than polite smiles. Experiment 2 established that, relative to polite smilers, genuine smilers are indeed perceived as friendlier and likely to want to talk for longer if approached. Critically, the degree to which individual face items were perceived as wanting to interact correlated strongly with the amount that social anxiety reduced willingness to approach in Experiment 1. We conclude it is the potential for social evaluation and scrutiny signaled by happy expressions, rather than their positive valence, that is important in social anxiety.

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In everyday life, expressions sometimes show *genuine* emotion (as in a smile of delight at seeing a friend) and are sometimes *posed* in symbolic gesture (as in smiling to be polite). Recently, there has been growing interest in whether genuine and posed expressions are misperceived, or responded to atypically, in various clinical disorders. *Misperception* of expression authenticity has been reported in autism (for happiness, Boraston, Corden, Miles, Skuse & Blakemore, 2008), depression (sadness, Douglas, Porter, & Johnston, 2012), and psychopathic traits (fear and sadness, Dawel et al., in press). Atypicalities have also been found in people's *downstream responses* to emotion authenticity. For example, while the usual pattern is for people to report greater willingness to help others displaying genuine rather than posed distress, this preference for genuine is significantly reduced in high psychopathic traits (Dawel et al., in press).

Here, we provide the first examination of whether there are any genuine-posed differences in social anxiety. Social anxiety is characterised by a “marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others” (American Psychiatric Association, 2013, p. 202). Symptoms vary continuously across the general population (Furmark, Tillfors, Stattin, Ekselius, & Fredrikson, 2000; Machado-de-Sousa et al., 2010) and, at the clinical extreme, manifest as Social Anxiety Disorder (American Psychiatric Association, 2013).

Our article focuses on smiles. This follows a recent theoretical shift in the social anxiety literature towards interest in responses to positive facial expressions (for review, see Kashdan, Weeks, & Savostyanova, 2011), rather than only the traditional interest in negative emotions (Staugaard, 2010). The general theoretical idea is that socially anxious individuals fear they will be subjected to social evaluation and potential negative repercussions *even when the social context initially appears positive* (e.g., they approach someone who is smiling at them; Kashdan et al., 2011; Weeks & Howell, 2012). Someone who is socially anxious might, for example, worry that they will be unable to meet the social expectations of someone who wishes to engage in a friendly conversation with them (Alden & Wallace, 1995). Consistent with these ideas, high social anxiety has demonstrated associations with reduced ratings of willingness to approach happy, smiling faces (for meta-analysis, see Kivity & Huppert, 2016).

Previous studies of approach in social anxiety, however, have not distinguished between the different types of smiles that exist (Ekman, 1982). Here, we focus on two that are common in everyday life (Figure 1). These are *genuine smiles*, which arise from genuinely-felt happiness, and what can be termed “*polite smiles*”. Polite smiles still send social signals of general positive intent, but are posed rather than arising from genuine happiness and, for the

stimulus set we use, are accurately perceived by “the average observer” as *not* displaying genuine happiness (Dawel et al., 2017).

<Figure 1 about here>

Figure 2 illustrates two stages of processing where, theoretically, we hypothesise atypical processing of genuine versus polite smiles could occur in social anxiety. These are: first, *perceiving* the emotional nature of an expression; and, then, *responding* to the social meaning inferred from that expression. These two ideas are often inadvertently confounded in the literature, and thus we believe there is value in being explicit about this distinction.

<Figure 2 about here>

Concerning *perception*, our study provides the first test of whether individuals high on social anxiety might misperceive the authenticity of smiles, as occurs in some other clinical disorders (e.g., Boraston, Corden, Miles, Skuse & Blakemore, 2008; Douglas, Porter, & Johnston, 2012; Dawel et al., in press). For example, perhaps the reduced willingness to approach happy faces in high social anxiety (Kivity & Huppert, 2016), which comes from studies primarily using genuine smiles (see Supplement S1 for evidence), might be due to misperceiving genuine smilers as merely being polite.

Concerning *downstream responses*, we examine willingness to approach genuine and polite smilers. The normal approach response to smiles is expected to be positive (i.e., ratings on the approach end of the scale rather than the avoid end) for both genuine and polite smiles; this is because both smile types imply approach behaviour will be received positively. However, relative to polite smiles, we argue genuine smiles might signal that the smiler wishes to engage with the observer in a friendlier, more in-depth way, and potentially for longer. For example, if you spot a work colleague at the mall and they send a polite smile your way, you might interpret this to mean they do not have time and/or do not want to chat, and so you should smile politely back, or say hello briefly, and go on your way. However, if the colleague were to smile genuinely at you, you might perceive this as inviting a more prolonged, chatty interaction. The relevance of this to social anxiety is that high social anxiety individuals might respond more aversely to genuine than polite smiles because they prefer to keep interactions as brief as possible, to avoid any unnecessary opportunity for scrutiny and concomitant social evaluation. This idea predicts the reduction in willingness to approach smiles seen in social

anxiety (Kivity & Huppert, 2016) *would be stronger for genuine than polite smiles* and, moreover, that the degree of reduction should be correlated with the degree to which individual smile stimuli indicate potential for a deeper and/or more prolonged social interaction.

In the present study, we test these ideas. Experiment 1 tests both perception of smile authenticity (genuineness ratings) and, downstream, ratings of willingness to approach genuine versus polite smiles, as a function of level of social anxiety. Experiment 2 then obtains further ratings (friendliness, estimates of talk-time if approached for directions) of our face stimuli to determine whether the degree of perceived potential for social interaction signalled by each face can explain the effects of social anxiety we find in Experiment 1.

EXPERIMENT 1

Experiment 1 tested a large sample of undergraduates ($N=141$) covering a broad range of social anxiety levels. This allowed analysis treating social anxiety as both a continuous population variable (Furmark, Tillfors, Stattin, Ekselius, & Fredrikson, 2000; Machado-de-Sousa et al., 2010) and also subgroup splits into typical and high social anxiety groups based on whether scores exceeded a criterion value suggestive of potential clinical Social Anxiety Disorder (De Vente, Majdandzic, Voncken, Beidel, & Bögels, 2014).

Ability to *perceive* the authenticity of genuine and polite smiles was assessed using a genuineness rating task (Figure 1). Here, our research question was whether higher social anxiety was associated with any form of atypicality in perception (e.g., genuine smiles wrongly rated as polite).

Typicality of intended approach *responses* to genuine versus polite smiles was assessed using a willingness to approach ratings task. The specific context given was approaching a stranger to ask for directions. This was selected because asking for directions is a common situation in which people need to approach a stranger in the real world, and also one which even people very high on social anxiety would likely be forced to encounter (unlike, say, approaching someone to make friends at a party). For people at the low end of the social anxiety spectrum, we expected strong positive approach ratings for polite as well as genuine smiles, given that even mere politeness should be sufficient to signal willingness to provide directions; the question of interest was then whether social-anxiety-related reductions in rated willingness to approach differed for genuine and posed smiles.

Finally, to assess whether any apparent associations were specifically due to *social* anxiety, as opposed to negative affect more generally (Campbell et al., 2009; Gilboa-

Schechtman et al., 2005), we included as covariates general anxiety (state and trait) and depression. These variables were selected because general state or trait anxiety can be associated with increased avoidance (Heuer et al., 2007; Roelofs et al., 2009), and depression can be associated with a lack of motivation that could potentially produce decreased approach behaviours (Joiner, 2002).

METHOD

Additional details of our Methods can be found in Supplement S2, including further stimulus details and task order.

Participants

Data analysed were from 141 young adults¹ (62% female, 38% male; $M_{age}=21$ years, $SD=3.3$, range=18-40) from the Australian National University (ANU). All were Caucasian to match the face stimuli (noting cultural differences in percepts of genuineness; Thibault, Levesque, Gosselin, & Hess, 2012). All reported normal or corrected-to-normal vision. None reported a clinical or neurological disorder that might impair face task performance (exclusion criteria included autism spectrum disorder, ADD/ADHD, epilepsy). Course credit or \$22.50 cash was given for the 1.5-hour study, which was approved by the ANU Human Research Ethics Committee. The session also included two other tasks plus questionnaires relevant to another study (which did not concern social anxiety; see Supplement S2 for details).

Recruitment aimed to capture a wide range of social anxiety levels, via a mix of general advertising, plus flyers targeting individuals with higher levels of social anxiety traits (e.g., asking, “*Are you prone to feeling anxious at parties? Do you worry a lot about meeting new people, or about what other people think of you? Do you find yourself avoiding social situations?*”).

Social anxiety measures

We used two measures of social anxiety. The *Social Phobia and Anxiety Inventory–brief version* (SPAI-18; Turner, Beidel, Dancu, & Stanley, 1989) provides a comprehensive measure of social anxiety. The SPAI-18 also has an established clinical cut-off point, whereby

¹ The sample overlaps with the $N=94$ "average observer" sample Dawel et al. (2017, Experiment 3) and $N=140$ from Dawel et al. (in press). Those articles do not include the key measures reported here (social anxiety, approach ratings).

scores above 48 indicate social anxiety symptoms are potentially in the clinical range (De Vente, Majdandzic, Voncken, Beidel, & Bögels, 2014). The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) provides a more focused measure of social interaction anxiety, and is purely continuous (i.e., there is no established cut-off value suggestive of clinical levels of symptoms).

Table 1 confirms we sampled adequately from the high end of the social anxiety spectrum, with almost half our sample scoring above the SPAI-18 clinical cut-off ($n=65$ with SPAI >48). Because SPAI-18 scores alone cannot establish clinical diagnosis (formal diagnosis would require further assessment, including clinical interview), we refer to this group as having 'high-SA', and the remainder as having 'typical-SA' ($n=76$).

<Table 1 about here>

Face Stimuli: Genuine and polite smiles

Genuine and polite smile stimuli (see examples in Figure 1) were happy photographs from the genuine and posed expression sets normed in Dawel et al. (2017; labelled in that article as the perceived-as-genuine and perceived-as-fake sets respectively). We tested 15 genuine smile stimuli and 15 polite smile stimuli (30 stimuli in total).

Genuine smiles were captured in circumstances where there was good reason to think the people displaying the expressions were actually feeling happy. The *eliciting* circumstances for genuine smiles were: watching funny movie clips (images from the FacePlace database; Righi, Peissig, & Tarr, 2012); trained method actors invoking a felt experience of happiness (images from Gur et al., 2002); and celebrating winning a sporting grand final (images from news media, http://www.fairfaxsyndication.com/C.aspx?VP3=CMS3&VF=FXJO50_1). Congruent with the elicitation method, the genuine smile set were also *perceived* by “the average observer” (i.e., average of $N=94$ undergraduates in Exp. 3 of Dawel et al., 2017) as genuinely happy. This was defined as, for each of the 15 items included in the genuine smile set, a mean rating significantly greater than zero on a scale of -7=completely fake to +7=completely genuine, with 0=don't know (grand mean rating across the $n=15$ items = +4.1, ranging from +2.6 to +5.2 for individual items).

In contrast, the polite smile stimuli were elicited by instructions to pose a happy expression (images from the KDEF, Lundqvist et al., 1998; and English-acted expression images from Gur et al., 2002), or to activate specific facial musculature to pose a prototypical happy expression (images from RaFD; Langner et al., 2010). The polite smiles were perceived

by “the average observer” in Dawel et al. (2017) as *not* genuinely happy, defined as a rating *not* significantly greater than 0 on the -7 to +7 genuineness rating scale for each of the 15 polite smile items (grand mean rating across the $n=15$ items = -1.0, ranging from -4.0 to 0.6).

The genuine and polite smile sets demonstrate high internal consistency in ratings tasks (here, Cronbach’s α for genuineness ratings: genuine smiles=.78, polite=.81; and for approach ratings: genuine smiles=.84, polite=.78). This is despite the sets necessarily containing some variation in sex-of-face, exact intensity, and viewpoint (frontal viewpoint looking approximately at the camera and thus “at” the participant in the experiment, or three-quarter viewpoint looking clearly “away from” the participant). Importantly, the genuine and polite smile sets were matched on viewpoint and sex, with each comprising 5 front view females, 4 three-quarter view females, and 6 three-quarter view males each. Supplementary Table S2 lists each individual genuine and polite smile item, including information on its database source, viewpoint, sex, and norm-rated genuineness and intensity (from Dawel et al., 2017).

All faces were cropped to standard dimensions, and placed in a rectangular frame with white background (all background context was edited out). Faces were $6.9^\circ \times 9.1^\circ$ (whole head) at a viewing distance of 50 cm.

Experimental rating tasks

Each trial presented a face at screen centre until response. Each face was shown once per task, in a different random order for each participant. Trials on which the participant recognised the identity of the face as familiar (2.4%, due to some stimuli showing professional sports players) were excluded.

Perception of genuine and polite smiles: Emotion genuineness ratings. Participants rated the genuineness of emotion displayed in each expression from -7 (*completely fake*) through 0 (*don’t know*) to +7 (*completely genuine*). Any trials where the face was not first accurately identified as showing happy (in a forced choice between happy, four other emotions, and neutral) were deleted (5% of trials).

Willingness-to-approach ratings. For each face stimulus, participants rated how likely they would be to approach or avoid the person shown to ask for directions if they were lost, from -7 (*most likely to avoid out of this set*) through 0 (*no preference*) to +7 (*most likely to approach out of this set*). This approach rating task also included angry, disgusted and neutral expressions from Dawel et al. (2017) to validate the approach responses. As expected, participants wished to always *avoid* people showing anger and disgust, with strong negative ratings (genuine anger $M = -4.0$, $SD = 1.3$, $CI_{95}[-4.2, -3.8]$, posed anger $M = -3.7$, $SD = 1.3$,

CI₉₅[-3.9, -3.5]; genuine disgust $M = -1.8$, $SD = 1.5$, CI₉₅[-2.0, -1.6], posed disgust $M = -2.7$, $SD = 1.2$, CI₉₅[-3.0, -2.5]). (Also note that, consistent with Kivity & Hupperts' 2016 meta-analysis, social anxiety was not related to approach ratings for negative expressions; see Supplement S3 for details.)

Covariate measures: state-trait anxiety and depression

General anxiety was measured using the *State-Trait Anxiety Inventory* (STAI; Spielberger et al., 1983), and depression using the 14-item depression subscale of the *Depression and Anxiety Stress Scales* (DASS-depression; Lovibond & Lovibond, 1995).

RESULTS

Our analyses focus on correlational and regression approaches, which enable us to analyse social anxiety as a continuous variable in keeping with theoretical arguments social anxiety is best conceptualised as a continuum of traits (Furmark et al., 2000; Machado-de-Sousa et al., 2010). Supplemental Figure S2 confirms social anxiety scores were sufficiently normally distributed for valid analyses using these methods. Initial correlational analysis revealed findings were virtually identical for the SPAI-18 and SIAS (Supplement S4), so for simplicity of presentation, and to maximise power, all continuous analyses report results for a single combined measure calculated as the average of each participant's z -scores, i.e., $(z_{\text{SIAS}} + z_{\text{SPAI-18}})/2$.

In addition, between-groups comparisons of mean ratings for the high- relative to the typical-SA group (illustrated in Figure 3) provides extra information about the effects of social anxiety in individuals who have a greater likelihood of meeting clinical diagnostic criteria. Between-groups analyses will also facilitate comparison of our results with other social anxiety studies that have adopted a high or clinical versus typical groups approach (e.g., Campbell et al., 2009; Gilboa-Schechtman et al., 2005), and also indicates where overall ratings fall on the scale (e.g., whether certain face types are rated as being on the “genuine” or “fake” sides of the scales).

<Figure 3 about here>

Normal perception of genuineness

Higher social anxiety was not associated with any misperception of smile authenticity. Analysing social anxiety as a continuous variable, there was no correlation of social anxiety scores with genuineness ratings for genuine smiles, $r = -.047$, $p = .291$, nor for polite smiles, $r = .077$, $p = .183$. For group-based analyses, Figure 3A shows the high- as well as the typical-SA group rated the genuine smiles as clearly genuine and the polite ones as *not* genuine as expected, and targeted t-tests found no significant difference in ratings of genuineness for high- versus typical-SA for genuine smiles, $t(139) = .77$, $p = .439$, $d = .13$, nor for polite smiles, $t(139) = 1.23$, $p = .220$, $d = .21$. A mixed ANOVA on genuineness ratings, with social anxiety between-groups (high-SA, typical-SA) and smile type within-groups (genuine, polite), confirmed the only significant effect was that of smile type—with genuine smiles being perceived as more authentic than polite ones, $F(1, 139) = 651.55$, $MSE = 2.85$, $p < .001$, $\eta_p^2 = .82$. There was no significant main effect of SA group, $F(1, 139) = 0.29$, $MSE = 3.86$, $p = .593$, $\eta_p^2 < .01$, nor interaction of SA group with smile type, $F(1, 139) = 2.49$, $MSE = 2.85$, $p = .117$, $\eta_p^2 = .02$.

Atypical willingness to approach ratings

In contrast, when it came to participants' ratings of how much they would want to approach each person, an important new finding regarding smile authenticity emerged. While we replicated Kivity and Hupperts' (2016) basic meta-analytic result of reduced approach ratings for happy faces with higher social anxiety, we found this association was significantly stronger for genuine smiles than polite ones ($r_{\text{genuine}} = -.378$, $p < .001$, vs $r_{\text{polite}} = -.197$, $p = .019$, William's test for difference in dependent correlations, $t = 2.56$, $p = .012$). Moreover, covariate analysis revealed an independent association of social anxiety with approach ratings *only* for genuine smiles, and not for polite ones. Table 2 reports key findings from including covariates in stepwise multiple linear regression, with separate models for genuine and polite smiles. At Step 1, we entered covariates anxiety (STAI-trait, STAI-state) and depression (DASS-depression). At Step 2, we then entered social anxiety as the predictor of interest. For genuine smiles, results showed an independent contribution of higher social anxiety (i.e., over and above depression and general state/trait anxiety), indicating that social anxiety was *independently* associated with reduced willingness to approach. For polite smiles, an independent contribution was found only for STAI-state anxiety, and *not* for social anxiety.

<Table 2 about here>

Comparison of the high- and typical-SA groups (Figure 3B) also revealed some extra information about the nature of the association between social anxiety and approach ratings for genuine versus polite smiles. A mixed ANOVA on approach ratings, with social anxiety between-groups (high-SA, typical-SA) and smile type within-groups (genuine, polite), confirmed there was a clear interaction of SA group with smile type, $F(1,139)=8.60$, $MSE=.70$, $p=.004$, $\eta_p^2=.06$.² Targeted t-tests established this interaction had two important components. First, our core finding of a stronger reduction in approach for genuine than polite smiles with higher social anxiety manifested as a significant reduction in willingness-to-approach in the high- relative to the typical-SA group for genuine smiles, $t(139)=3.53$, $p=.001$, $d=.59$, while there was no significant reduction for polite smiles, $t(139)=1.33$, $p=.185$, $d=.23$. Second, we found the stronger reduction in approach for genuine smilers lead to the high-SA group showing an unusual pattern of being *less* willing to approach genuine smilers than polite ones, $M_{genuine}=2.27$, $M_{polite}=2.63$, $t(64)=2.28$, $p=.026$, $d=.28$, in circumstances where the typical-SA group showed a trend in the opposite direction, $M_{genuine}=3.12$, $M_{polite}=2.89$, $t(75)=1.80$, $p=.076$, $d=.21$.

Altogether, these results provide clear evidence of a stronger reduction with social anxiety in willingness to approach genuine smilers relative to polite ones.

Power analysis

Post-hoc power analysis established our study was adequately powered to reveal the key bivariate association, between social anxiety and willingness to approach ratings. In particular, a sample of 84 was needed to achieve power of .80 with alpha set to .05 for a medium effect size (i.e., of the size found in Kivity & Hupperts' 2016 meta-analysis, where the relevant Hedge's $g = 0.63$; analysis conducted using the pwr package in R). Our actual sample of $N=141$ considerably exceeded this number, noting also that our calculations conservatively used the lowerbound for a medium effect size ($r=0.3$ Cohen, 1988).

Robustness of the approach findings

We next tested the strength and replicability of our core new finding—of a stronger social anxiety-related reduction in approach ratings for genuine relative to polite smiles—in several ways.

² The main effect of social anxiety group was also significant, $F(1,139)=8.03$, $MSE=2.70$, $p=.005$, $\eta_p^2=.06$, but was uninformative in light of the significant interaction and t-test results. There was no significant main effect of smile type, $F(1,139)=0.43$, $MSE=0.70$, $p=.514$, $\eta_p^2<.01$.

First, we investigated whether the stronger reduction we found for genuine smiles could be attributed to them being perceived as more intense than polite smiles (e.g., Dawel, Palermo, O’Kearney & McKone, 2015). Our total stimulus sets did indeed contain intensity differences (genuine M intensity = 6.2, SD = 1.0, CI_{95} [5.7, 6.7], polite M = 4.2, SD = 0.8, CI_{95} [3.8, 4.6], on scale 1=*weak* to 9=*strong*; ratings from Dawel et al., 2017).³ However, we were able to create intensity-matched subsets of items by taking the lowest intensity genuine smiles (6 items, M intensity = 5.2, SD = 0.4, CI_{95} [5.0, 5.4]) and the highest intensity polite smiles (6 items, M = 4.9, SD = 0.3, CI_{95} [4.8, 5.1]). Column B of Table 3 presents bivariate correlations for these intensity-matched subsets, and shows the pattern of results mirrored our original findings in column A. Namely, the social anxiety correlation for genuine smiles was significantly stronger than that for polite smiles, William’s test $t=2.22$, $p=.028$.

<Table 3 about here>

Next, we tested whether our findings were robust across sex-of-face and viewpoint, using subsets of our stimuli showing: female faces in front view; female faces in three-quarter view; and male faces in three-quarter view (columns C1-3 of Table 3). Again, results generally mirrored our findings for the full stimulus set. In all cases, a significant association was observed between social anxiety and approach ratings for genuine smiles, which was always numerically stronger than that observed for polite smiles. This genuine-polite difference was significant for female faces in front view, and approached significance for female faces in three-quarter view. (Note, Supplemental Table S4 shows that results for the SPAI-18 and SIAS separately also replicate this pattern.)

Finally, we examined the replicability of our core findings across independent participant samples. To do so, we took random subsamples that were only half the size of our full sample. Specifically, on each of one million runs, we took a subsample of $n=70$ randomly with replacement from our full sample of $N=141$, and then calculated the bivariate correlation between social anxiety and approach ratings separately for genuine and polite smiles. We found the correlation of social anxiety with approach ratings was stronger for genuine than polite smiles on >99% of runs, verifying this effect is indeed extremely robust.

³ Intensity differences are difficult to avoid because intensity is in fact one of the physical cues that can contribute to perceiving a happy expression as genuine; Dawel, Palermo, O’Kearney & McKone, 2015).

INTERIM DISCUSSION AND EXPERIMENT 2

Concerning *perception*, Experiment 1 results establish there is no misperception of smile authenticity associated with social anxiety (i.e., no atypicality in Box A of Figure 2). Theoretically, this argues our core new finding—that social anxiety is more strongly associated with reduced willingness to approach genuine than polite smilers—cannot be attributed to simple misperception of smile authenticity (e.g., mistakenly interpreting genuine smiles as just polite).

Instead, to explain our core finding, we need to look to atypicality in later stages of processing, involving people's responses to the *meaning* of genuine and polite smiles (Box B of Figure 2). While there are a number of potential differences in meaning between genuine and polite smiles, we have argued one key difference is that genuine smiles are likely to signal *greater potential for social interaction* than polite smiles. This is relevant to social anxiety because a deeper and/or longer social interaction would increase exposure to the social scrutiny and evaluation that is feared by socially anxious individuals. There have, however, been no empirical tests of these ideas.

To test whether genuine smiles do in fact signal greater potential for interaction than polite ones, in Experiment 2 we asked a new set of participants (undergraduates *not* selected for social anxiety) to rate additional attributes of our faces. One group of participants rated how much the faces from Experiment 1 appeared to be "genuinely friendly" as opposed to "just being polite", on the grounds that friendliness is something that, in the real world, is indicative of potential for *deeper* engagement during social interaction. A second group of participants rated how long each of the genuine and polite smilers would wish to talk for if approached in our asking-for-directions scenario, on the grounds that longer talk-time is indicative of potential for a *longer* social interaction.

These data allowed us to test two specific proposals. First, if genuine smiles do signal greater potential for interaction, our genuine smile stimulus set should be, on average, rated as more genuinely friendly, and as wanting to talk for longer, than the polite smile set. Second, we examined individual faces items. If greater potential for interaction does contribute to approach ratings being more strongly reduced with social anxiety, then we should find that higher ratings of friendliness and/or talk-time in Experiment 2 correlate with the amount that social anxiety reduced willingness to approach in Experiment 1.

METHOD

Participants

Data analysed were from 95 ANU undergraduate students (73% female, 26% male, 1% other; $M_{age}=20$ years, $SD=1.6$, range=19-29) who completed the study in psychology lab classes. As in Experiment 1, all were Caucasian and reported normal or corrected-to-normal vision, and none reported a clinical or neurological disorder that might impair face task performance (exclusion criteria as for Experiment 1). Participants were divided into two groups, and randomly assigned to complete *either* the "friendliness" rating task *or* the "talk-time" rating task.

Stimuli and experimental tasks

Stimuli were the genuine and polite smile photographs used in Experiment 1. Stimuli were shown one at a time, in different random order for each participant, at the same size as in Experiment 1.

All participants were given the Experiment 1 asking-for-directions scenario: "we want you to imagine that you are on a street on your way to an appointment, and that you are lost and in a hurry, and need to ask someone for directions". In the "friendliness" rating task, the first group of participants ($N=46$) were asked to "imagine you are walking past that person and rate how much you think they are just being polite versus genuinely friendly", on a scale of -7 (just being polite) to +7 (genuinely friendly), where 0=not sure. In the "talk-time" rating task, the second group of participants ($N=49$) were asked to "imagine you are walking past that person and rate how long you think they would want to talk for if you approached them to ask for directions", from -7 (less than average) to +7 (more than average), where 0=average.

RESULTS

Results in Figure 4 show that, as predicted, rated potential for interaction was greater for genuine than polite smiles. For friendliness, the genuine smile set was perceived as being genuinely friendly, with mean friendliness ratings significantly *greater* than zero, $M_{genuine} = 2.43$, $t(14)=6.94$, $p<.001$ (for one-sample two-tailed comparison to 0), $d=1.79$; while, in contrast, the polite smile set were perceived as *not* genuinely friendly, with mean rating significantly *below* zero, $M_{polite} = -1.84$, $t(14)=6.95$, $p<.001$, $d=1.79$. For talk-time, participants estimated the faces would want to talk for longer than average (i.e., rating scores >0) for both

genuine and polite smiles, as might be expected given both types of smiles are positively-valenced social signals. Importantly, however, genuine smilers were rated as wanting to talk for significantly longer than polite smilers, $M_{genuine}=1.79$ vs $M_{polite}=.45$, $t(28)=5.77$, $p<.001$, $d=2.11$.

<Figure 4 about here>

Examining individual smile stimuli, we found mean friendliness ratings for each item (i.e., its rating averaged across participants) correlated very highly with mean talk-time ratings, such that the more a face was perceived as being genuinely friendly, the longer people estimated that person would want to talk for, $r(30)=.950$, $p<.001$ (correlation includes all $n=30$ face stimuli, i.e., 15 genuine smiles, 15 polite). The near-perfect correlation between these two variables is particularly striking given the ratings for each came from different groups of participants. The near-perfect correlation also argues the two variables are essentially measuring a single underlying construct, and we thus averaged the ratings of friendliness and talk-time to produce a "potential for interaction" score for each smile stimulus.

We then examined whether these potential for interaction scores were able to explain differences in the strength of association between social anxiety and willingness to approach in Experiment 1. To obtain a measure of the strength of association between social anxiety and approach from Experiment 1, we calculated the slope (B) of the relationship between social anxiety and approach ratings for each smile stimulus; this assesses the amount of reduction in willingness-to-approach with social anxiety, for that item. We then tested the correlation of the Experiment 1 slopes (B) with the Experiment 2 potential for interaction scores. We found a significant, medium sized relationship in the predicted direction, $r(30) = -.423$, $p=.020$, as illustrated in Figure 4C. (Note the correlation was unchanged if the outlier visible in the scatterplot was removed, $r(29) = -.432$, $p=.019$) This is consistent with our argument it is the degree to which a face signals greater potential for interaction (and thus social scrutiny) that drives stronger reductions in willingness to approach with higher social anxiety.

GENERAL DISCUSSION

The present study provides the first evidence that the *authenticity* of happy expressions matters to people with social anxiety. Specifically, Experiment 1 found approach ratings reduced more strongly with social anxiety for genuine than polite smiles. Indeed, willingness to

approach reduced *specifically in association with social anxiety*, as opposed to other aspects of negative affect that correlate with social anxiety (i.e., state/trait anxiety and depression) *only* for genuine smiles. An additional finding was that our high-SA group were actually *less* willing to approach genuine smilers than polite ones, in circumstances where the typical-SA group showed a trend in the opposite direction (i.e., slight preference for approaching genuine over polite smilers to ask for directions). These effects of authenticity on approach emerged despite there being *no misperception* of smile authenticity associated with social anxiety.

Instead, reductions in willingness to approach with high social anxiety could be explained by the degree to which faces signalled potential for interaction. Experiment 2 established that, relative to polite smilers, genuine smilers were perceived as signalling greater potential for social interaction in our asking for directions scenario (genuinely friendly rather than just being polite, and longer talk-time). What is more, analysing individual face items, perceived potential for interaction in Experiment 2 (averaged ratings of friendliness and talk-time) correlated strongly with the degree to which social anxiety reduced approach in Experiment 1. These results provide a compelling explanation for why social anxiety—which is defined by fear of social scrutiny (American Psychiatric Association, 2013)—was associated with a stronger reduction in approach for genuine than polite smiles, and also predict the relative aversion to genuine over polite smiles we found in the high-SA group.

Theoretical implications in social anxiety

Traditionally, the focus in social anxiety has been on fear of *negative* evaluation (e.g., Clark & Wells, 1995). However, recent theorising argues socially anxious individuals are often also concerned about people evaluating them positively, not just negatively (e.g., Kashdan et al., 2011; Weeks, Jakatdar, & Heimberg, 2010). Theoretically, fear of positive evaluation arises from concerns about social reprisal (Weeks & Howell, 2012). For example, a socially anxious individual might fear that other members of their social group will “punish” them for standing out in a positive way (e.g., by putting them “down” and embarrassing them in front of others; Howell & Weeks, 2012). Alternatively, they may feel they are unable to meet the evaluator’s positive expectations and will therefore inevitably cause disappointment (Alden & Wallace, 1995). In the context of the present study, these ideas about fear of positive evaluation can explain why higher social anxiety is associated with reduced willingness to approach others to the degree that they signal greater potential for social interaction even when the context—a smiling face—suggests social evaluation is (at least initially) likely to be positive. In return, our results provide empirical support for this theoretical shift towards including fear of positive

evaluation in conceptualising social anxiety (Kashdan et al., 2011). Further, our results add the nuanced point that this fear is affected by the degree of potential for interaction and social scrutiny signalled by different smile types.

Our findings also accord with the broader idea that understanding responses to positively-valenced social signals in social anxiety is important (e.g., Kashdan et al., 2011). However, our results suggest an emphasis on “positive-valence” or “happy” expressions per se as the relevant theoretical construct would not be targeting the critical dimension of meaning. Instead, our results imply that a critical dimension is the degree to which a positive social signal conveys potential for a deeper and/or more extended social interaction and thus greater opportunity for social evaluation by others, which is higher for genuine smiles than polite ones. Importantly, this emphasis on the potential for social evaluation signalled by happy expressions is also implied by social anxiety diagnostic criteria, recalling that social anxiety is characterised by a “marked fear or anxiety about one or more social situations in which the individual *is exposed to possible scrutiny* by others” (American Psychiatric Association, 2013, p. 202).

We also note that, while we have identified here one difference in social meaning between genuine and polite smiles, there may be other differences that are also relevant to social anxiety. For example, it is possible that, when seeing a genuine smile, people high on social anxiety may perhaps misinterpret this as a sign of amusement, and specifically as a sign of amusement directed specifically at *them* (i.e., that they are being laughed at). Our present results do not obviously support this as a major factor contributing to reduced willingness to approach—in that it predicts stronger approach reductions for front view faces looking “at” the participant than for three-quarter view faces looking away from the participant, which was not observed—but it may be a factor worth exploring in future research.

Finally, one point made absolutely clear by our results is that not all “happy” expressions are equal in social anxiety. Reinforcing this argument, previous work has also found socially anxious individuals respond atypically to blended, ambiguous smiles created by inserting neutral or negative-valence eyes (e.g., eyes from anger or disgust expressions) into smiling faces (Gutiérrez-García & Calvo, 2014, 2016). For these stimuli, higher social anxiety is associated with an exaggerated shift towards judging the blended smiles as “not happy” (Gutiérrez-García and Calvo, 2014) and also as untrustworthy (Gutiérrez-García and Calvo, 2016). Noting that these blended smiles are not real, Gutiérrez-García and Calvos’ results imply atypicalities in social anxiety can also sometimes be found for *nongenuine* smiles, not just genuine smiles. The findings also suggest that future research might usefully examine

social anxiety effects for other types of smiles that occur in everyday life but do not signal genuine emotions, such as masking expressions (e.g., smiling to hide feeling upset).

Potential implications in clinical settings

Our results argue it would be valuable to examine in detail how people with diagnosed clinical-level Social Anxiety Disorder respond to different smile types. For example, some clinicians may have a practice of approaching clients in a genuinely friendly manner, implicitly assuming that friendliness will put a client at ease. Our present results, however, imply the rather counterintuitive conclusion that, in socially anxious clients, looking friendly may *increase* the client's anxiety, and impede rapport. Instead, our results suggest that simply being polite may be less overwhelming for the client. It would be valuable to test this prediction, including, for example measuring clients' real-world approach behaviour (rather than merely ratings of intended approach, as assessed here) to real people (rather than just static face stimuli) who communicate genuine friendliness versus mere politeness.

Beyond social anxiety: The broader importance of investigating emotion authenticity

Finally, our results join several other cases in which clinical conditions have demonstrated associations with either misperceiving or responding atypically to the authenticity of others' emotions (e.g., autism, Boraston, Corden, Miles, Skuse & Blakemore, 2008; depression, Douglas, Porter, & Johnston, 2012; psychopathic traits, Dawel et al., in press). Unfortunately, traditionally clinical research, including in social anxiety for negative-valence expressions (see Supplement S3), has focused almost exclusively on posed facial expressions. We have shown elsewhere that posed expressions from standard databases are often *not* perceived as showing genuine emotion (Dawel et al., 2017). This can affect downstream emotional and social responses in at least one other clinical disorder (psychopathy, where affective psychopathic traits are associated with atypicalities in arousal and willingness to help for genuine vs posed distress, Dawel et al., in press), and can also sometimes result in invalid theoretical conclusions (e.g., implications of impaired affective processing in schizophrenia obtained with posed facial expressions do not hold up with genuine facial expressions; Davis & Gibson, 2000; LaRusso, 1978). Overall, there is now considerable evidence over-reliance on posed expressions may be generating inaccurate or, at the very least, incomplete conclusions about emotion processing. It is thus increasingly evident that emotion authenticity is a critical parameter that needs to be brought to the foreground of facial expression research.

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Table 1

Descriptive statistics for questionnaire measures

Questionnaire	Mean (SD)	Range	Cronbach's α
SPAI-18 (full sample, N=141)	47.1 (21.2)	2-94	.98
Typical-SA group: SPAI \leq 48 <i>n</i> =76	31.3 (12.0)	2-48	.95
High-SA group: SPAI >48 <i>n</i> =65	65.6 (12.9)	48-94	.95
SIAS (full sample, N=141)	30.5 (12.9)	10-62	.85
Typical-SA group: SPAI \leq 48 <i>n</i> =76	22.8 (8.1)	10-42	.73
High-SA group: SPAI >48 <i>n</i> =65	39.6 (11.5)	13-62	.82
Covariate measures (full sample, N=141)			
STAI-state	36.7 (10.4)	20-68	.92
STAI-trait	43.6 (11.0)	20-75	.93
DASS-depression	8.5 (7.1)	0-37	.92

Notes. SPAI-18 (Turner et al., 1989; De Vente et al., 2014)=18 items rated from 0 (never) to 6 (always). SIAS (Mattick & Clarke, 1998)=20 items rated from 0 (not at all characteristic or true of me) to 4 (extremely characteristic or true of me). STAI (Spielberger et al., 1983)=20 items each for state/trait anxiety, rated from 1 (not at all/almost never) to 4 (very much so/almost always). DASS-depression (Lovibond & Lovibond, 1995)=14 items rated from 0 (never) to 3 (almost always).

Table 2

Stepwise regressions testing whether social anxiety (Step 2) makes a unique contribution to predicting willingness to approach ratings

	<i>R</i>	<i>R</i> ² ch.	Beta	Part	<i>p</i> ¹
A. Genuine smiles					
Step 1: STAI-state/trait, DASS-depression	.385	.148			<.001
Step 2: Social anxiety ²	.415	.024			.048
Final model:					
Social anxiety			-.214	-.156	.048
STAI-state			.020	.015	.852
STAI-trait			-.255	-.132	.092
DASS-depression			.005	.003	.964
B. Polite smiles					
Step 1: STAI-state/trait, DASS-depression	.298	.089			.005
Step 2: Social anxiety ²	.308	.006			.332
Final model:					
Social anxiety			-.109	-.079	.332
STAI-state			-.276	-.203	.014
STAI-trait			-.015	-.008	.926
DASS-depression			.080	.057	.485

Notes. *R*² ch.=*R*² change. ¹*p* values for each step are for *F* change. ²Social anxiety=(*z*_{SIAS} + *z*_{SPAI-18})/2. Bolded values are significant at *p* < .05. Note, in addition to our theoretical reasons for running these regression models, it was also methodologically important to analyse the unique effects associated with each of the questionnaire measures as several were (as expected) highly correlated (Supplement S5 reports bivariate correlations).

Table 3. Comparison of bivariate correlations for all stimuli (column A) with results from subsets of stimuli matching genuine and polite smiles on intensity (column B) and varying on sex-of-face and viewpoint (columns C1-3)

	A. All stimuli (15 genuine, 15 polite)	B. Intensity- matched subsets (6,6)	C1. Female faces, front view (5,5)	C2. Female faces, 3Q view (4,4)	C3. Male faces, 3Q view (6,6)
Bivariate correlation, Pearson's r with p -value in parentheses					
Genuine smiles	-.378*** ($<.001$)	-.284** (.001)	-.233** (.005)	-.291*** ($<.001$)	-.294*** ($<.001$)
Polite smiles	-.197* (.019)	-.139 (.100)	-.030 (.724)	-.148 (.081)	-.225** (.007)
William's test p -value ¹	.012*	.028*	.026*	.056	.450

¹Testing for the difference in dependent correlations for genuine versus polite smiles, e.g., for all stimuli, testing $r = -.378$ for genuine smiles against $r = -.197$ for polite smiles.

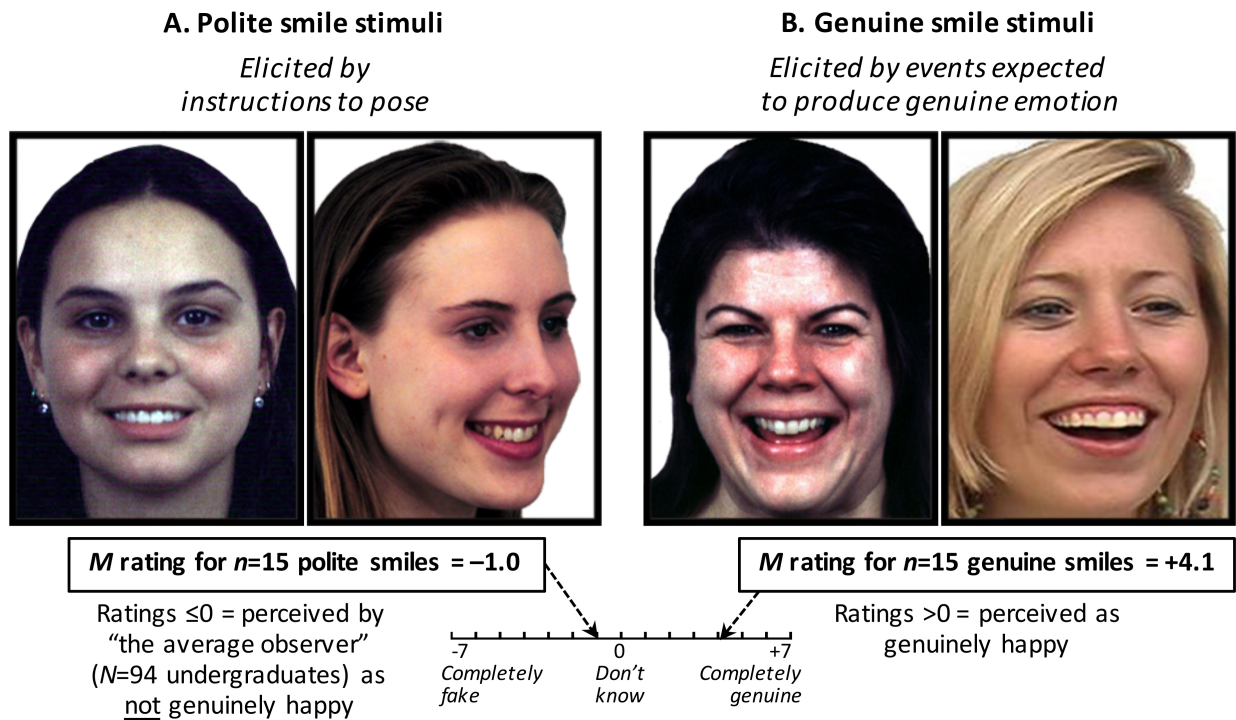


Figure 1. Examples of genuine and polite smiles. A. Our polite smile stimulus set were deliberately posed by displayers (e.g., following instructions to move certain muscle groups), and were also perceived by “the average observer” (mean of $N=94$ undergraduates in Dawel et al., 2017) as not showing genuine happiness (i.e., mean rating of genuineness slightly below zero). B. Our genuine smile stimulus set were elicited by events expected to produce genuine emotion (e.g., watching a funny movie), and were also perceived by “the average observer” as genuinely happy (i.e., mean rating of genuineness well above zero). Face images from Gur et al., (2002), FacePlace (Righi, Peissig, & Tarr, 2012), and the Karolinska Directed Emotional Faces set (KDEF; Lundqvist et al., 1998).

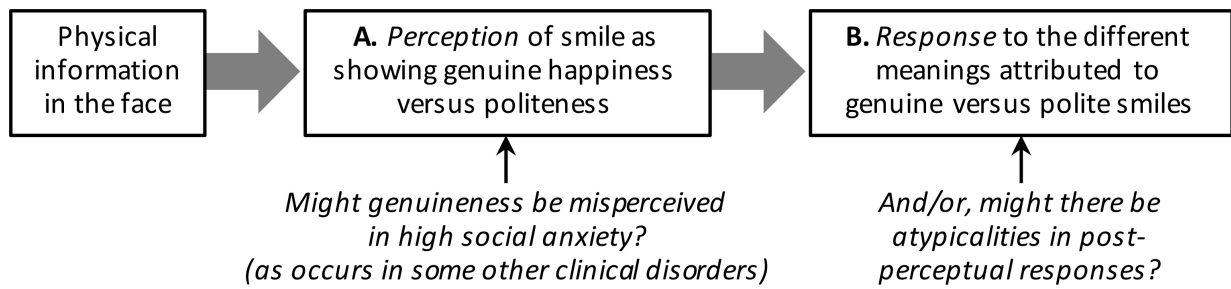
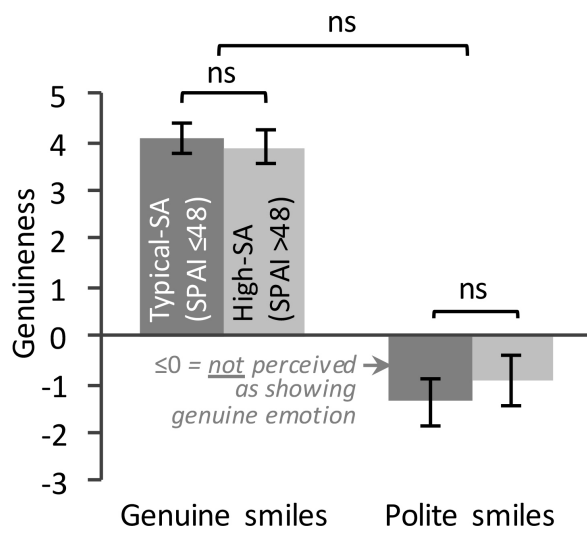


Figure 2. Framework for understanding the broad stages of processing emotion authenticity which could potentially be affected in social anxiety.

A. Genuineness ratings



B. Approach ratings

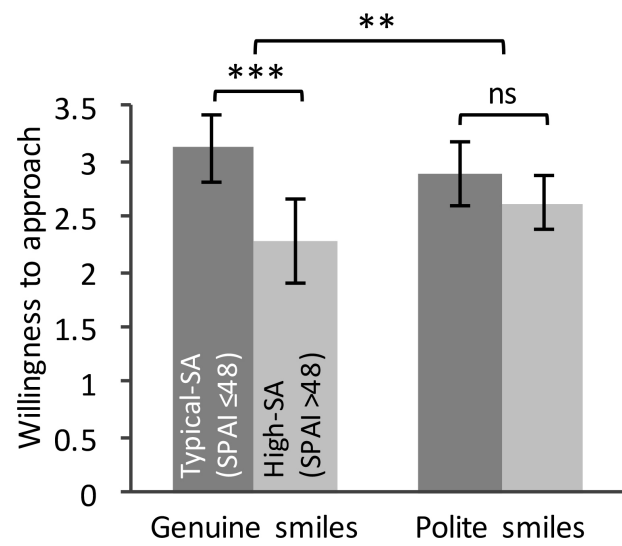


Figure 3. Experiment 1 results. Mean ratings of (A) genuineness and (B) approach for genuine and polite smiles, comparing our typical-SA (SPAI >48, $n=65$) and high-SA (SPAI ≤ 48 , $n=76$) groups. Note that for approach ratings, as expected, participants tended to give positive ratings for both types of smiles, consistent with the idea that mere politeness should be sufficient to signal willingness to provide directions. Error bars=CI₉₅.

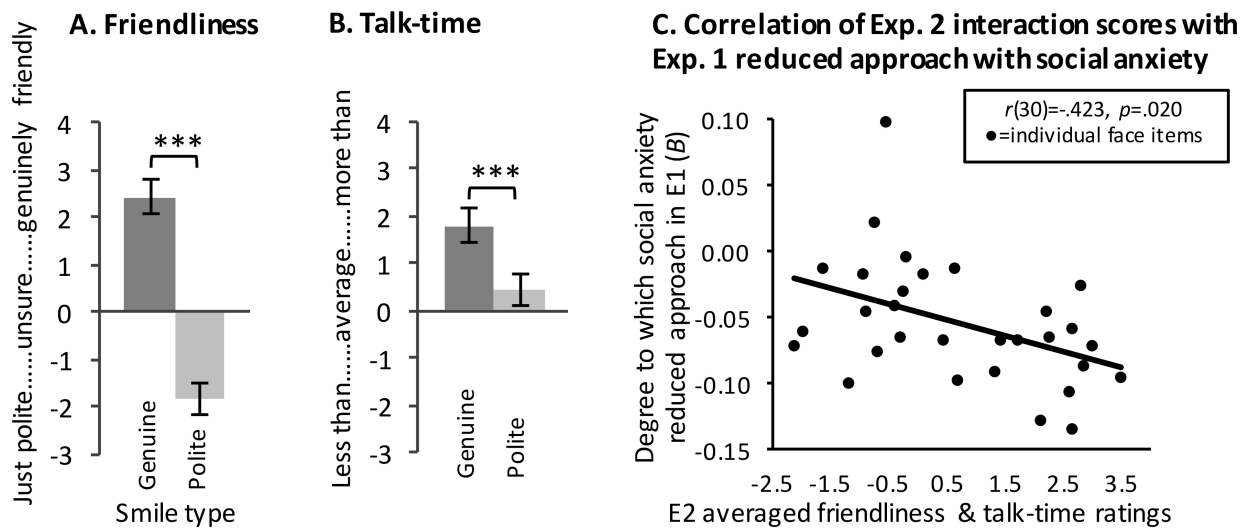


Figure 4. Experiment 2 results. Mean ratings of (A) how genuinely friendly ($N=46$) and (B) how long a person (face) would be likely to want to talk for if asked for directions ($N=49$), for genuine and polite smiles. Error bars $\pm CI_{95}$. (C) Across the individual face items, the degree to which willingness to approach reduced with higher social anxiety (i.e., slope measured by B from regression fit in Experiment 1) was strongly associated with potential for interaction scores (average of Experiment 2 friendliness and talk-time rating for each stimulus).