The effects of social anxiety on interpersonal evaluations of warmth and dominance

Thomas L. Rodebaugh a,*, Tatiana Bielak b,1, Vanja Vidovic b, David A. Moscovitch b

a Department of Psychology, Washington University, St. Louis, United States
b Department of Psychology, Centre for Mental Health Research, University of Waterloo, Canada

1. Introduction

Interpersonal dysfunction has been described as a core feature of social anxiety disorder (SAD), such that interpersonal data may provide key insights into the disorder (e.g., Alden and Taylor, 2010). Multiple studies over decades have shown that SAD leads to self-reports of interpersonal impairment (Aderka et al., 2012; Rodebaugh, 2009; Rodebaugh, Fernandez, & Levinson, 2012; Schneier et al., 1994), and that the relationship between SAD and self-reported impairment in friendships is not better explained by other psychological disorders, demographic characteristics, or subjective impairments in other types of relationships (i.e., family relationships: Rodebaugh, 2009; Rodebaugh et al., 2012). The positive impact of friendships on health status is highlighted within a growing literature indicating that poor social support (often operationalized as quality of friendships) poses a risk for mortality (Giles, Gローン, Luszcz, & Andrews, 2005; Kroenke, Kubzansky, Schernhammer, Holmes, & Kawachi, 2006). Thus, reducing the barriers that exist for individuals with higher social anxiety in forming meaningful interpersonal connections may be a matter of both quality of life and enhancement of physical health and longevity.

Many studies have investigated a question crucial to this topic: Does social anxiety lead to negative judgments from others, making new relationships less likely to form or be satisfying? The balance of this literature indicates that social anxiety, and SAD, leads to negative judgments from others. Evidence for this contention ranges from the finding that social anxiety is associated with a stereotype of being odd (Fox, Fernandez, Rodebaugh, Menatti, & Weeks, in press) to multiple studies establishing that being high in social anxiety, or having SAD, leads to initially negative judgments when individuals are observed or interacted with in the laboratory (e.g., Creed & Funder, 1998; Voncken and Dijk, 2013). However, several findings contradict a blanket statement that high social anxiety always leads to negative judgment. First, participants who are higher in social anxiety typically underestimate the quality of their interactions: Even when social anxiety has an impact on the interaction, a person with higher social anxiety is likely to overestimate this impact (Voncken and Bogels, 2008). Second, the evidence suggests that it is not higher social anxiety itself, but...
rather self-protective behaviors associated with higher social anxiety, that leads to these negative judgments. For example, safety behaviors account for much of the impaired social performance of people with SAD (Rowa et al., 2015), and when individuals with SAD are tasked with reducing self-protective safety behaviors during a conversation, they and their conversation partners perceive the conversation to have gone better (Taylor and Alden, 2010). Voncken and Dijk (2013) found that, even without specific instructions, more prolonged contact tends to ameliorate negative judgment against people with higher social anxiety, particularly when self-disclosure is high (Voncken and Dijk, 2013). Thus, a person with SAD who maintains social contact long enough, appropriately self-discloses, and does not employ self-protective behaviors may not be judged negatively.

A third point that contradicts the idea that social anxiety always leads to negative judgment emerges from data regarding friendship. The only available evidence suggests that when people with SAD do develop friendships, their friends show no clear tendency to be less happy with the friendship (Rodebaugh et al., 2014). This was true despite the fact that the person with SAD remains likely to express dissatisfaction with the friendship (particularly when the relationship has lasted less than a decade (Rodebaugh et al., 2014)). That is, people with SAD report impairment even when negative judgment from the other parties in the friendship appears not to be a factor.

Thus, taken as a whole, there is some support for the notion that being judged negatively by others contributes to the social difficulties of those struggling with social anxiety. However, the same group of studies suggests that increased self-disclosure and reduction in safety behaviors can overcome this effect, given time. Indeed, some evidence suggests that, at least when paired with another person with higher social anxiety and given specific self-disclosure instructions, people with higher social anxiety can achieve a strong sense of closeness quite quickly: During a short laboratory self-disclosure task, the highest ratings of closeness were associated with dyads in which both partners had higher social anxiety (Kashdan and Wenzel, 2005). A crucial issue in friendship development and quality among people with higher social anxiety may therefore be under what circumstances they are willing to self-disclose, drop safety behaviors, and persist in interactions. That is: Under what circumstances do people with higher social anxiety judge others to be either worth interacting with, or at least safe to get to know? In the current study, we turned our attention to the question of how social anxiety might affect judgments of people with varying characteristics as a first step to determining how social anxiety might lead to dysfunctional decisions regarding who to approach and who to avoid.

To investigate how social anxiety moderates the relationship between warmth and dominance and interpersonal judgments, we adopted an interpersonal circumplex approach (Leary, 1957; Wiggins, 1979). From this perspective, interpersonal behavior is conceptualized as ranging along two theoretically orthogonal dimensions, typically arranged in an axis system. The horizontal axis represents nurturance, love, or affiliation whereas the vertical axis represents status, agency, or dominance (Gurtman, 1993) (cf. Fig. 1 for a representation of the circumplex with data overlaid from this study). Thus, a given interpersonal behavior, or trait-like tendency to such behavior, can be described as involving some level of dominance (versus submissiveness) and warmth (versus coldness). Multiple studies have demonstrated that higher social anxiety and avoidance are associated with tendencies to be more submissive and cold (Horowitz, Alden, Wiggins, & Pincus, 2000; Kachin, Newman, & Pincus, 2001; Rodebaugh, Gianoli, Turkheimer, & Olteanu, 2010). Further, recent studies have provided initial evidence that people with higher social anxiety judge others differently based on dominance and warmth in comparison with people lower in social anxiety (Aderka, Haker, Marom, Hermesh, & Gilboa-Schechtmann, 2013; Haker, Aderka, Marom, Hermesh, & Gilboa-Schechtmann, 2014). Globally, such findings have indicated that people with SAD may be more inclined to make interpersonal judgments based on dominance than warmth. That is, people with SAD may weigh information about dominance in their decision making more so than information regarding warmth. Such findings are consistent with evolutionary theories that suggest that people with SAD may be overly sensitive to information about social rank and dominance and less sensitive to affiliation signals (e.g., Gilbert, 2001).

We developed a series of vignettes describing characters that systematically varied in dominance and warmth. We asked two samples of participants (one undergraduate and one drawn from the community) to read multiple vignettes and rate the extent to which they would like to interact with each of the characters in their day-to-day life and how socially desirable (i.e., possessing positive characteristics, such as intelligence and ambition) each character seemed to them. Using multilevel models, we tested how the characters’ levels of dominance (versus submissiveness) and warmth (versus coldness) affected these ratings for the samples as a whole, as well as whether participants’ levels of social anxiety moderated these ratings. Our hypotheses were that, (H1) overall, as long established by previous research, people would generally rate warmer individuals as more socially desirable and worth interacting with (Asch, 1946; Fiske, Cuddy, & Glick, 2007; Kelley, 1950); (H2) social anxiety would impact the relationship between warmth and other ratings such that warmth would have less of a positive impact for participants with higher social anxiety; (H3) social anxiety would impact the relationship between dominance and other ratings such that dominance would have a more negative impact for people with higher social anxiety.

2. Method

2.1. Participants

Two moderately large samples were recruited for the present study. The first consisted of 403 adults in North America (USA and Canada). These participants were recruited through Amazon Mechanical Turk, a crowdsourcing internet marketplace, by responding to a study ad which was posted on the website. The participants received $1.00 in exchange for completing the online study. The second sample was comprised of 176 students at an urban Canadian university who were enrolled in at least one psychology course at the time of study completion. These participants were not selected for participation on any pre-determined criteria, and all of them received a credit towards their psychology course in exchange for participating in the study. All participants in both samples completed the study entirely online through a secure research software service (Qualtrics) and reported that they paid at least moderate attention to the study (see Section 2.5). All participants provided informed consent, and all procedures had received full ethics clearance through an institutional ethics committee. The duration of the study was approximately 40 min. For descriptive characteristics of the study samples, see Table 1.

2.2. Measures

A note about reliability. It is important to note that most of the measures in this study were administered at the within-level (i.e., participants used them to rate vignettes). When items are only administered once to participants, the only reliability of concern is whether they vary together across participants, such that when one item is higher for participant A than participant B, the
remaining items also tend to be higher for participant A. However, our measures of desire for interaction, social desirability, and similarity were administered across vignettes and can also be analyzed across participants. It is thus of concern whether they reliably vary together across both vignettes (within-level) and participants (between-level). We therefore examined the multilevel composite reliability coefficients described by Gledhof, Preacher, and Zygphur (2014). Gledhof et al. (2014) provide a method to estimate the reliability of the items given a multilevel confirmatory factor analysis in which there is a single factor for both the within and between level. The composite reliability formula they provide is essentially a ratio of shared variance to total variance (using the square of the summed factor loadings as well the sum of the residual variances; see Gledhof et al. (2014) for details). In each case we examined reliability coefficients in the separate manipulation check dataset (see Section 3.1).

**Desire For Future Interaction Scale (DFI; Coyne, 1976)** is a 9 item scale, which assesses the extent to which raters wish to have various types of interactions with another person (e.g. “I would want to work with this person”, “I would want to sit on the bus next to this person”). Each item was rated from –3 (“strongly disagree”) to 3 (“strongly agree”). In previous studies, this measure showed excellent internal consistency and interrater reliability, (e.g., Cronbach’s alpha of 0.94 and ICC of 0.94 in Voncken, Alden, Bogels, & Roolofs, 2008). This measure is typically described as assessing desire for interaction (consistent with its title) or of liking versus rejection (e.g., Papsdorf and Alden, 1998; Voncken, Alden, & Bogels, 2008). For this measure reliability at the within level was excellent (0.91) and reliability at the between level was good (0.82).

**Social desirability ratings.** To evaluate interpersonal desirability of characters (see Creation and validation of vignette stimuli regarding the characters), participants were instructed to rate the central character depicted in each vignette across five desirable traits as compared to the average person: intelligence, ambition, strength of character, happiness, and achievement. This was a set of diverse desirable attributes that has been used in previous research (e.g., Bielak and Moscovitch, 2013). Participants were asked to state how they felt the character presented in the vignette compared to the average person on these five attributes, using a scale ranging from –3 (“much less than average”) to 3 (“much more than average”). We averaged across the attributes to obtain an overall Desirability Index score. This measure was shown to have good internal consistency in Bielak and Moscovitch’s (2013) study, with Cronbach’s alphas of 0.77–0.80. Composite reliability for this measure in the separate manipulation check dataset at the within level was adequate (0.76) and at the between level was excellent (0.998). This difference in level of reliability would indicate that the items showed only reasonable reliability in how well differences in one item across vignettes were matched by differences in the other items. In contrast, when one participant tended to rate vignettes overall more highly on one item, it was quite likely that that participant would also rate them more highly on the other items.

**Ratings of similarity (Papsdorf and Alden, 1998).** Three items assessing perceived similarity between the self and the character in the vignette were administered. These included, “The person in the vignette is a different kind of person than me [reverse-scored],” “The person in the vignette talks and acts like me,” and “The person in the vignette seems like me.” These items were previously used as a brief measure of similarity, and have been shown to have strong psychometric properties (e.g., Cronbach’s alphas > 0.92 in Papsdorf & Alden 1998 and Voncken et al., 2008). Composite reliability for this measure in the separate manipulation check dataset at the within level was good (0.88) and at the between level was excellent (0.98).

**Social Interaction Anxiety Scale (Mattick and Clarke, 1998), Straightforward Items** (Rodebaugh et al., 2011; Rodebaugh, Woods, & Heimberg, 2007) (SIAS-S). The SIAS is a 20-item self-report questionnaire that measures anxiety-related reactions to different social interactions (e.g., I get nervous if I have to speak with someone in authority [teacher, boss]). It uses a 0 (not at all) to 4 (extremely) Likert-type scale. Rodebaugh et al. (2011) have reported that the 17 straightforwardly-worded items of the SIAS are more valid indicators of social interaction anxiety than the reverse-scored items in undergraduate, community, and clinical samples. This 17-item score, hereafter referred to as the SIAS-S score, has demonstrated excellent internal consistency (α = 0.93) and factorial validity in undergraduate samples and has demonstrated strong construct validity in both undergraduate and clinical samples (Rodebaugh et al., 2007). Internal consistency for the SIAS-S items in the current study (which were only relevant at the between level) was excellent (α = 0.95 in the MTurk sample and 0.99 in the student sample).

### 2.3. Materials

**Creation and validation of vignette stimuli.** We created a series of 16 short vignettes describing characters who differed systematically along the orthogonal domains of warmth versus coldness and dominance versus submissiveness, as outlined in the interpersonal circumplex (Wiggins, 1979). The interpersonal circumplex can be summarized via eight octants, each representing a combination of different levels of dominance and warmth. Each vignette consisted of a short paragraph representing an interpersonal challenge faced by a fictional character that would be
prototypical for a particular level of warmth versus coldness and dominance versus submissiveness as represented within the circumplex. To ensure that the vignettes accurately represented each octant of the interpersonal circumplex, every vignette was written to contain at least 2 items from each of the following measures that were designed to assess self-report of behavior relevant to the circumplex: the International Personality Item Pool–Interpersonal Circumplex (IPIP–IPC; Markey & Markey, 2009), a measure of one's standing on the dimensions of warmth and dominance, and the Inventory of Interpersonal Problems (IIP-64; Horowitz et al., 2000), a measure of interpersonal problems arising from problematic expression of warmth versus coldness and dominance versus submissiveness. We incorporated two items from each of these measures into every vignette character description. For example, octant 1 of the circumplex is sometimes labeled Assured/Dominant (e.g., Markey & Markey, 2009) and is characterized by a high level of dominance and a moderate level of warmth. We therefore embedded two items from the IIP-64 (“find it difficult to take instructions from people who have authority over me” and “too independent”) as well as two items from the IPIP-IPC (“speak loudly” and “demand attention”) into the first vignette for octant 1, concerning the character Nicole, which can be reviewed in the Supplementary appendix. Similarly, octant 3 of the circumplex is sometimes labeled Cold or Cold-Hearted (e.g., Markey & Markey, 2009) and is characterized by low levels of warmth and moderate levels of dominance. When creating a vignette describing a cold individual, we embedded the two items from the IIP-64 including “it is hard for me to give a gift to another person” and “it is hard for me to feel close to other people.” We also embedded the following two items from the IPIP–IPC: “I believe people should lend for themselves” and “I am not interested in other people’s problems.” The resulting vignette (for the character Monica) can be reviewed in Supplementary appendix.

Two vignettes were developed for each of the eight octants. In order to systematically study the potential impact of gender on interpersonal judgments, we developed two versions of each of the sixteen vignettes: one representing a central male character, and depicting a central female character, thus resulting in a total of 32 vignettes (the male and female versions of the 16 vignettes, two for each octant). A complete set our vignettes is provided in the Supplementary appendix.

Pilot testing and revision of vignettes. After they were developed and refined by our team of investigators, the vignettes underwent two rounds of validation testing, described in full in the Supplementary appendix. Further testing was conducted on a separate pilot sample and is presented in the Section 3.

2.4. Procedure

After obtaining informed consent to participate, each participant was presented with a series of eight of the possible vignettes, all of which were of a single gender. Participants were randomly assigned to see a random selection of eight exclusively male or female vignettes based on his or her self-reported gender. Half of the male participants were assigned to female vignettes and half to male vignettes, and the same was true for female participants. Thus, each participant was presented with 8 of 16 possible vignettes within his or her condition. We did not ask participants to rate all vignettes because we believed that rating more than 8 vignettes would produce fatigue and boredom. Because the vignettes rated were randomly assigned, those not rated were missing completely at random (as is true whenever missingness is completely unrelated to participant characteristics; cf. Graham, Taylor, Olchowski, & Cumsille, 2006) and therefore could be appropriately estimated in the multilevel models.

Participants read each vignette and then answered several questions about the vignettes, including rating the character's desirability and similarity and the participant's desire for future interaction with the character. The vignette was presented at the top of each page of questions, so the participants could easily refer back to it as they answered the questions. After rating all eight vignettes, participants completed five rounds of a distractor task, a computerized sequence game similar to those marketed to children. This task, which took about 5 min to complete, was included as a short intermission that was intended to reduce spillover effects from the vignette rating task to the completion of the questionnaires at the end of the study, including the SIAS, described above, as well as other measures not relevant to the present article.

Participants were asked at the beginning, middle, and end of the study about their intended or actual level of attentiveness to the study questions. Participants were informed that evidence of inattentive responding would not penalize or revoke any participation credit, but that we required a truthful response in order to know whether to utilize their data. Thirty-one participants whose responses indicated they did not intend to pay attention or did not pay attention at least most of the time, as well as 15 who did not respond regarding how much attention they paid, were excluded from analyses, and are not reported in the above participant totals. A single (student) participant was excluded (and not reported in totals above) for reporting nonsensical data (i.e., this participant indicated she was a 12-year-old, divorced, Canadian whose first language was Spanish).

2.5. Data analytic procedure

Data were analyzed using multilevel modeling (MLM) in Mplus version 7 (Muthén & Muthén, 1998–2012), using the robust maximum likelihood estimator (referred to as MLR) that can accommodate departures from multivariate normality. The warmth versus coldness and dominance versus submissiveness associated with each vignette was used to predict participant ratings of the vignettes on one level (within-participant). On the second level (between-participant), social anxiety, as measured by the SIAS-S, along with cross-level interactions between social anxiety and dominance and social anxiety and warmth, were used to predict the participant ratings. Notably, within Mplus the cross-level interactions involved social anxiety, a between-participant variable, predicting the magnitude of the within-level slope of (for example) dominance and participant ratings. That is, social anxiety predicted the way that, in this example, dominance predicted participant ratings. In the broader literature, social anxiety's type of prediction is typically referred to as a cross-level interaction and is conceptually equivalent to an interaction between social anxiety and either dominance or warmth in predicting participant ratings in a linear regression: Such a result indicates that social anxiety moderates the association between vignette characteristics and participant ratings. Because most of the variables had a zero-point with a non-arbitrary meaning, we left variables centered, although we also examined models that were grand mean centered to ensure that the pattern of findings remained unchanged (which was the case).

For the primary hypothesis tests, models were first estimated in a multiple group analysis in the two datasets to test whether constraining the effects of the SIAS-S across groups was plausible. Two sets of groups were of interest: The two types of participants (community versus undergraduate) and the two conditions (viewing all male or all female characters). A test of parameter constraints allows a test of whether two or more elements of a multilevel model differ across groups. In this case, the tests concerned whether the size of the estimates for the effects of the SIAS-S differed across groups. If the size of these effects differed significantly, the test
would return a significant result, indicating that the effects of the SIAS-S differed across groups and should therefore be explored separately by group.

More specifically, a parameter constraint test was conducted in which all effects of SIAS-S (i.e., on intercepts and slopes in the parlance of Mplus) were constrained (i.e., all of the effects relevant to the hypotheses regarding social anxiety), and the omnibus test of significance was consulted to determine whether the groups could be combined. In this test, SIAS-S was additionally regressed upon gender, because gender was missing for only one participant, which therefore allowed nearly all participants to be included in the analysis. In all models, the effects could be constrained across groups, and the SIAS-S was therefore predicted by dataset (which was not missing for any participant) in the final models, allowing the use of all participants despite missing data (see Missing data). We then used the same test across condition (gender of vignettes seen) to determine whether models could also be constrained across condition. Results of these preliminary analyses indicated that all models could be constrained across condition.

**Missing data.** Most missing data were missing by design, because participants were asked to rate only 8 of the 16 vignettes. Thus, participants had about 50% covariance coverage for cells involving vignette ratings on each analysis. The amount of missing data was otherwise relatively minor, with more than 98% of the data present for the remaining cells in the covariance matrix for each analysis.

3. Results

3.1. Manipulation check

To test whether the vignettes varied as intended in warmth versus coldness and dominance versus submissiveness, a distinct sample of undergraduate participants ($N = 179$), drawn from the same source as the undergraduate sample, but not overlapping with it, were asked to rate the vignettes on dominance and warmth (more details on this sample are available from the first author, and are not given here for conciseness). Each participant rated a randomly selected subset of 8 of a possible 16 vignettes presented in the same format as was used for the primary data collection. A multilevel model in which participant ratings of warmth and dominance were predicted by the intended levels of warmth and dominance was conducted, resulting in four slope parameters; two of these slopes reflected the intended concordance (e.g., rated warmth with intended warmth) and two reflected mismatch (e.g., rated warmth with intended dominance). Notably, it was implausible that the ratings would achieve ideal replication of the intended warmth and dominance of the vignettes because participants were given an ordinal scale ($-2, -1, 0, +1, +2$). In contrast, the octants as plotted on the circle would require coordinates that include nonordinal numbers (specifically, $1.41$ and $-1.41$). For example, the octant between warm and dominant would be correctly mapped by the coordinates $1.41, 1.41$, whereas the octant between warm and submissive would be correctly mapped by $1.41, -1.41$. In contrast, participants would have had to rate these vignettes $1, 1$, and $-1$ on the scale provided to be closest to the intended coordinates.

To convey the overall results, we plotted in Fig. 1 the intended position of the vignettes and the predicted average position in the data. As can be seen in the figure, the participants replicated the general circumplex pattern, but did not match it completely. In particular, participants showed a bias to rate the vignettes somewhat more warmly and dominantly than intended for colder and more submissive octants. However, there was no instance in which a vignette category intended to be at a certain level of warmth or dominance switched position with another vignette category with a different intended position.

![Circumplex with intended position of vignettes (four-pointed stars) and average predicted position in pilot data (six-pointed stars).](image-url)
3.2. Primary hypothesis tests

Constraint across data source and condition. As noted above, we tested whether effects related to social anxiety could be constrained across (a) data source and (b) condition. In each case, the test was nonsignificant (ps > 0.465), indicating that the constrained parameters were not significantly different. We therefore examined the model collapsed across data source and condition.

Desire for interaction. The relevant coefficients are displayed under the Model 1 heading in Table 2. Focusing first on how warmth and dominance of vignettes influenced the desire to interact with the person in the vignette, participants rated warmer characters more highly relative to colder characters and dominant characters lower relative to less dominant characters, although the latter effect was weaker. Only the effect for warmth was specifically hypothesized (in H1). As can also be seen in Table 2, social anxiety displayed interaction effects with both dominance and warmth. Both H2 and H3 were supported for this measure, because social anxiety influenced the effects of both warmth and dominance on desire for interaction (i.e., both interaction terms were statistically significant).

The interpretation of the coefficients in Table 2 can be challenging due to the multiple interactions, as well as issues common to multilevel modeling (e.g., issues of centering; see e.g., Enders and Tofighi, 2007). We therefore emphasize the overall impact of social anxiety on desire for interaction ratings, which can be seen in Fig. 2. In this figure, predicted values for high social anxiety (SIAS-S = 60, for which 10 participants had either that score or higher), median social anxiety (SIAS-S = 18), and low social anxiety (SIAS-S = 0; 25 participants had a score of 0) are depicted. Points more toward the octant label indicate greater desire for interaction. Although the predicted values are the highest for all groups for warm submissive characters, participants with higher social anxiety rated their desire to interact with colder characters as stronger than did participants with lower social anxiety, so long as these characters were also submissive rather than dominant.

Social desirability. Findings for social desirability partially paralleled those for desire for interaction and can be seen under the Model 1 heading in Table 3. H1 (that warmth would lead to more favorable ratings) was supported, although higher dominance was also associated with more favorable ratings for social desirability. H3 was also supported, in that social anxiety interacted with dominance to predict ratings of social desirability, but the same effect was not seen for an interaction for warmth, so H2 did not receive support for this measure.

The overall effects of social anxiety on ratings of social desirability are depicted in Fig. 3. Although all participants were predicted to give the highest ratings to more dominant and warmly dominant characters, participants with higher social anxiety were much more inclined to give similarly high ratings to characters who were colder and more submissive. Notably, in both Figs. 2 and 3, the overall impression is of the range of positive impression being stretched toward coldness and submissiveness by higher social anxiety.

Unique effects on desire for interaction and social desirability. It seemed plausible that desire for interaction and social desirability would overlap in ratings made by participants, and, indeed, their within-level correlation was 0.36 (p < 0.001), suggesting a moderately strong relationship. We therefore examined the effects of social anxiety relative to each, above and beyond the other. The results of these analyses can be seen in Tables 2 and 3 in the columns under the Model 2 headings. The interactions between SIAS and dominance and warmth were somewhat different in these analyses: Controlling for social desirability, social anxiety interacted only with warmth for desire for interaction and not with dominance. In contrast, when controlling for desire for interaction, social anxiety interacted only with dominance for social desirability and not warmth. Main effects for social anxiety were generally unchanged. Thus, the fact that each construct showed some effect for both warmth and dominance in the initial test appeared due to overlap.

In terms of unique effects, social anxiety affected the way participants used information about warmth in judging desire for interaction (above and beyond social desirability), with higher social anxiety reducing the impact of warmth on these ratings, whereas it affected the way participants used information about dominance in judging social desirability (above and beyond desire for interaction), with higher social anxiety associated with a reduction in the impact of dominance on these ratings. In other words, higher social anxiety seemed to confer more tolerance for viewing both coldness and submissiveness as desirable, with the effect primarily being for coldness in regard to desire for interaction and submissiveness in terms of social desirability.

3.3. Post-hoc test of whether similarity accounts for these effects

We observed that the effects above for social anxiety resulted in participants with higher social anxiety giving more favorable ratings for colder and more submissive characters than participants with lower social anxiety. Notably, social anxiety and social avoidance have repeatedly been shown to lead to self-ratings of coldness and submissiveness (see Rodebaugh et al., 2010 for a review and extension). It therefore appeared plausible that the effects described above were due to participants with higher social anxiety rating characters who seemed similar to them more favorably.

To test this possibility, we conducted an analysis in which desire for interaction and social desirability were both regressed upon similarity, such that the estimated coefficients regarding warmth and dominance represented those effects above and beyond similarity. Thus, within-level similarity was a competing predictor for between-level social anxiety and its cross-level interactions. In this analysis, we also investigated whether social anxiety affected how similarity led to ratings of desire for interaction and social desirability (i.e., cross-level interactions between social anxiety and similarity). The related coefficients are shown under Model 3 in Tables 2 and 3.

Examining first the effects for social anxiety predicting aspects of social desirability and desire for interaction above and beyond similarity, the only effect that remained statistically significant was for higher social anxiety to predict generally higher ratings of social desirability. That is, social anxiety contributed to a global tendency to rate others as more socially desirable than would be expected based on similarity, warmth, and dominance. No other effects for social anxiety (including interactions with dominance and warmth) in predicting ratings of social desirability and desire for interaction reached statistical significance in this model (ps > 0.07). In contrast, similarity (along with warmth and dominance) predicted both desire for interaction and social desirability. It thus seemed plausible that the effects described in the primary analyses above were due to differences in similarity ratings. That is, within-level ratings of similarity appeared to be a stronger predictor of desirability and desire for interaction than social anxiety.

This model also tested whether social anxiety affected how ratings of similarity predicted social desirability and desire for interaction. Social anxiety did interact with similarity in predicting social desirability, but only showed a trend to interact with similarity regarding desire for interaction (p = 0.072). The nature of the effect was such that for participants with higher social anxiety, similarity had significantly less of an influence on ratings of social desirability.

To fully characterize the effects of social anxiety on similarity rating, we conducted an analysis in which social anxiety, warmth,
and dominance, as well as the interactions between social anxiety and warmth and social anxiety and dominance predicted similarity ratings. Participants showed a tendency to rate warmer characters as being more similar to them (estimate = 0.56, $p < 0.001$), but showed no tendency to rate more dominant characters as being more or less similar to them (estimate = 0.01, $p = 0.917$). On the average, higher social anxiety was associated with higher ratings of similarity (estimate = 0.05, $p < 0.001$), but this effect was balanced by social anxiety’s interactions with both warmth and dominance (estimates = −0.01 and −0.02, respectively, $p < 0.001$). That is, although higher social anxiety was related to a broad tendency to rate characters as similar to the self, the interactions meant that the broad tendency would be much reduced for warmer or more dominant characters, and compounded for colder and more submissive characters. Participants with higher social anxiety were thus significantly more likely than participants with lower social anxiety to rate both more submissive and colder characters as being more similar to themselves.

### 4. Discussion

We conducted this study to determine how social anxiety (and, by extension, SAD) might affect person perception. Our hypothesis was that social anxiety would reduce the positive effects of warmth and increase negative effects of dominance, such that people with higher social anxiety might state a greater prefer-

---

**Fig. 2.** Desire for interaction with vignette characters based on level of social anxiety. Points more toward the octant label indicate greater desire for interaction. Desire for interaction was scored such that the lowest possible value was −27 and the highest possible value was 27. Note that the values depicted are the predicted values, not the full range of values participants used. High Social Anxiety = S-SIAS score of 60; Median Social Anxiety = S-SIAS score of 18; low social anxiety = S-SIAS score of 0.

**Table 2**

<table>
<thead>
<tr>
<th>Within-level</th>
<th>Model 1: Desire for interaction</th>
<th>Model 2: Desire for interaction (unique above social desirability)</th>
<th>Model 3: Desire for interaction (unique above similarity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (SE)</td>
<td>Estimate (SE)</td>
<td>Estimate (SE)</td>
</tr>
<tr>
<td>Warmth</td>
<td>4.28*** (0.21)</td>
<td>3.59* (0.18)</td>
<td>3.43*** (0.18)</td>
</tr>
<tr>
<td>Dominance</td>
<td>−1.96*** (0.21)</td>
<td>−3.07** (0.19)</td>
<td>−1.99*** (0.18)</td>
</tr>
<tr>
<td>Social desirability</td>
<td>−</td>
<td>0.77* (0.04)</td>
<td>−</td>
</tr>
<tr>
<td>Similarity</td>
<td>−</td>
<td>−</td>
<td>1.63*** (0.06)</td>
</tr>
<tr>
<td>Between-level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social anxiety</td>
<td>0.06*** (0.02)</td>
<td>0.06* (0.02)</td>
<td>−0.01 (0.01)</td>
</tr>
<tr>
<td>Social anxiety × warmth</td>
<td>−0.03* (0.009)</td>
<td>−0.02** (0.007)</td>
<td>−0.01 (0.007)</td>
</tr>
<tr>
<td>Social anxiety × dominance</td>
<td>−0.02* (0.008)</td>
<td>−0.01 (0.007)</td>
<td>0.01 (0.007)</td>
</tr>
<tr>
<td>Social anxiety × similarity</td>
<td>−</td>
<td>−</td>
<td>−0.005 (0.003)</td>
</tr>
</tbody>
</table>

Note: SE = standard error, − = predictor not included in this model. Social anxiety is measured by the Social Interaction Anxiety Scale (Straightforward Items), estimates are unstandardized and their interpretation thus depends on each variable. See Fig. 2 and accompanying text for simpler substantive interpretations of the effects in the initial models. Each model also included the parallel model for social desirability, which is depicted separately in Table 3 for clarity. Variables were left in their raw form (no centering) for these models. Coefficients have the same level of significance when grand mean centering is used.

"**" $p < 0.05$.

"***" $p < 0.001$.
en for colder or more submissive potential interaction partners than would participants with lower social anxiety. Although the coefficients within the models appeared to support these hypotheses, the interpretation of the models overall was somewhat more nuanced than our initial hypotheses. People in general, including participants with higher social anxiety, found warmly submissive characters to be the most appealing to have in one’s daily life, and warmly dominant characters as most socially desirable. However, people with elevated social anxiety showed nearly as much desire for interaction with coldly submissive characters, and found submissive behavior almost as socially desirable as dominant behavior.

With additional tests, we clarified that the unique interaction effect of social anxiety on desire for interaction was related to warmth (with higher social anxiety conferring greater desire to interact with less warm characters), whereas the unique interaction effect of social anxiety on social desirability was related to dominance (with higher social anxiety associated with higher

Table 3
Multilevel models of warmth, dominance, and social anxiety predicting ratings of social desirability.

<table>
<thead>
<tr>
<th>Within-level</th>
<th>Model 1: Social desirability</th>
<th>Model 2: Social desirability (unique above desire for interaction)</th>
<th>Model 3: Social desirability (unique above similarity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>SE</td>
<td>Estimate</td>
</tr>
<tr>
<td>Warmth</td>
<td>0.91***</td>
<td>0.10</td>
<td>−0.07</td>
</tr>
<tr>
<td>Dominance</td>
<td>1.44***</td>
<td>0.10</td>
<td>1.89***</td>
</tr>
<tr>
<td>Desire for interaction</td>
<td>−</td>
<td>−</td>
<td>0.23***</td>
</tr>
<tr>
<td>Similarity</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Between-level</td>
<td>Social anxiety</td>
<td>0.04***</td>
<td>0.008</td>
</tr>
<tr>
<td>Social anxiety × warmth</td>
<td>−0.007</td>
<td>0.004</td>
<td>−0.001</td>
</tr>
<tr>
<td>Social anxiety × dominance</td>
<td>−0.01**</td>
<td>0.003</td>
<td>−0.008*</td>
</tr>
<tr>
<td>Social anxiety × similarity</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

Note: SE = standard error, * = predictor not included in this model. Social anxiety is measured by the Social Interaction Anxiety Scale (Straightforward Items). estimates are unstandardized and their interpretation thus depends on each variable. See Fig. 3 and accompanying text for simpler substantive interpretations of the effects in the initial models. Each model also included the parallel model for desire for interaction, which is depicted separately in Table 2 for clarity. Variables were left in their raw form (no centering) for these models. Coefficients have the same level of significance when grand mean centering is used.

*** p < 0.001.
** p < 0.01.
* p < 0.05.
Our showing ship friendships; and of individuals would show the typical preference for warmth, but not as large a preference due to a competing preference for people similar to themselves in warmth. People with higher social anxiety, however, appeared to differ from people with lower social anxiety in regard to ratings of social desirability, with people with higher social anxiety showing less of a link between similarity and social desirability. This finding might suggest that highly socially anxious individuals tend to see others who are like them as pleasant (or perhaps safer) to interact with but not necessarily more socially desirable. It might at first appear odd to assert that people with higher social anxiety, who tend to rate themselves lower on desirable qualities (Moscovitch, Ott, Rowa, Reimer, & Antony, 2009) should rate people who are similar to them more positively overall. However, this apparent paradox may be resolved if it is remembered that people with SAD are generally reported to think more positively about other people’s strengths and weaknesses than their own, such that thinking about whether they would judge another person harshly for a given quality is an often-recommended therapy technique (Heimberg and Becker, 2002).

One impetus for this project was to better understand which factors might be responsible for the discrepancy between self and friend reports of friendship quality for socially anxious individuals observed in the only extant data (particularly in newer friendships; Rodebaugh et al., 2014). We believe that our current results, combined with previous literature, provide some clues to this mystery. A key component of our interpretation is that warmth and dominance can be understood as a 45° rotation of extraversion and agreeableness (e.g., Markey & Markey, 2009), such that high extraversion is characterized by warm dominance and high agreeableness is characterized by warm submissiveness. Both extraversion and agreeableness have been implicated in interpersonal relationships, with extraversion primarily relating to impression formation (e.g., Meier, Robinson, Carter, & Hinsz, 2010) and agreeableness to maintaining relationships and relationship satisfaction (e.g., Malouf, Thorsteinsson, Schutte, Bhullar, & Kooke, 2010). Perhaps not surprisingly, and in keeping with the relationships seen between social anxiety and the interpersonal circumplex, (lower) extraversion and (lower) agreeableness have also been implicated in social anxiety and SAD, with a strong relationship with extraversion and a weaker relationship with agreeableness, or potentially only the trust facet of agreeableness (see e.g., Levinson, Kaplan, & Rodebaugh, 2014 for a review).

Adding our current results to the established associations between extraversion, agreeableness, social anxiety, and the interpersonal circumplex, we can sketch the following picture of the interpersonal world of people with higher social anxiety. Our results suggest that people with higher social anxiety are like those with lower social anxiety in preferring individuals who are warmer and admiring individuals who are more dominant. If people with higher social anxiety routinely dropped their self-protective behaviors and struck up friendships with such individuals, the existing literature on relationships would suggest that this would tend to result in relatively satisfying and long-lasting friendships, although perhaps more because of the friend’s warmth than the interpersonal characteristics of the person with higher social anxiety. However, warmer and more dominant individuals, while potentially appealing, might be judged as globally desirable and thus potentially “out of my league” by socially anxious individuals (e.g., Bielak and Moscovitch, 2013; Mahone, Bruch, & Heimberg, 1993). Previous studies (e.g., Kashdan and Wenzel, 2005) suggest that people with higher social anxiety feel more comfortable pursuing relationships (whether friend or romantic) with people who they perceive as similar to themselves, whom they may rate more positively than people who they see as dissimilar (see e.g., Voncken et al., 2008). However, existing data suggest that recruiting groups of participants with extreme levels (high versus low) of social anxiety does not mean that the friends of these participants will differ in social anxiety (Rodebaugh, Lim, Shumaker, Levinson, & Thompson, 2015). The implication is that people with higher social anxiety are neither uniformly successful in finding friends who are similar to them, nor in finding friends who are warmer or more dominant than they are: They appear more likely to have mixed success across both fronts.

People with higher social anxiety may thus fall in a particularly difficult position in terms of being satisfied with their interpersonal relationships. Our findings, in the context of interpersonal theory of relationships, suggests that they might be pulled in somewhat contradictory directions by the desire to befriend warm, confident others on the one hand, and the competing desire to stick to safer, more similar, less popular, or less well-liked social partners on the other hand. Being in a relationship with someone who is very similar (i.e., lower on warmth and dominance) may, on the one hand, feel more comfortable and familiar due to the shared attributes. On the other hand, it might be expected to lead to lower satisfaction (due to such issues as lower agreeableness, lower extraversion, and lower warmth). Practically speaking, such relationships might be characterized by taking less initiative to create opportunities to strengthen the relationship, and by the partners engaging in fewer behaviors that promote closeness and intimacy when they do spend time together (Alden and Taylor, 2011). In contrast, being in a relationship with a warmer, more agreeable, and more extraverted person might generate feelings of satisfaction offset by discomfort with dissimilarity, as well as by concerns around not being worthy of such a popular or socially desirable friend (Bielak and Moscovitch, 2015).

Conversely, for many individuals low in social anxiety, the virtues of social desirability and of similarity point to the same group of potential friends: those who are warm, and perhaps dominant. In addition to experiencing less mixed motivations and uncertainty when choosing social partners, these individuals may be particularly well-suited to having relationships they will be satisfied by, because the people they feel most similar to and comfortable with are the very people who tend to engage in relationship-building acts and ultimately have more satisfying relationships.

If the above propositions are generally correct, one would expect people with SAD to report being less satisfied with their friendships overall (among other relationships), which has been shown repeatedly (Adlera et al., 2012; Schneier et al., 1994). However, these propositions do not necessarily indicate that a specific, current friend of a person with SAD will be less satisfied than a comparable friend of someone without SAD. Part of the issue may be the fact that in the only available study (Rodebaugh et al., 2014) the task for the person with the disorder was to bring a single friend to the laboratory. People with SAD (versus people without) may have

---

3 Importantly, other authors have already outlined a number of ways in which social anxiety should be expected to impair relationship formation (see especially (Alden and Taylor, 2011)); here we focus on the implications of our current findings.
had a higher percentage of unsatisfied friends and romantic partners over time (and missed opportunities to begin relationships), but these relationship partners would also have been less likely to stay in the relationship over time and thus less likely to come to the lab. The important issues for people with SAD may be potential friends who never were, friends who were but were lost, and a periphery of current friends who might show less satisfaction with the friendship (but are also less likely to be asked to the laboratory or arrive if asked). People with SAD might also have a higher percentage of attempted friendships with colder and more submissive individuals, but these relationships would also be expected not to last as long, as well as be more distant (again, leading the friend not to come to the lab). Asking anyone to bring a single friend to the lab will begin a process that is biased toward the result of bringing the warmest, most agreeable person to the lab. The good news for people with SAD is that many of them do have such a friend (e.g., Rodebaugh et al. (2014) found no indication that people with SAD were less likely to bring a friend to the lab); the bad news is that their own satisfaction is likely to be impaired by their own sense of dissimilarity with their friend.

Our results must be interpreted in the context of our study’s limitations. A primary limitation is that the study was essentially a simulation of interpersonal judgment using narrative vignettes. Although it seems plausible to assume that effects found here would merely be either consistent or magnified in more ecologically valid circumstances, this remains an assumption to be tested. Further studies with a range of interpersonal stimuli would be useful here. Similarly, we focused entirely on self-report, which should be addressed in future work. The potential limitations of each of our samples would seem to counterbalance each other given that effects were equivalent across samples: The results cannot be said (for example) to apply only to undergraduates, nor only to community participants who complete work for money via the internet. Although it would have been useful to know that some participants had diagnosable SAD, it seems very likely that many people in the sample indeed had the disorder, given the size of the sample and the range of social anxiety displayed. Ultimately, studies including diagnosed participants and using longitudinal and experimental paradigms will be most useful for isolating the causal mechanisms underlying the effects we observed.

Until those future studies can be done, our results provide a glimpse into the processes of person perception that may impact the interpersonal functioning of people with higher social anxiety and SAD. In preferring similar people to themselves, people with higher social anxiety are just like everyone else: The likely consequence of this preference, however, may lead to unusual and debilitating interpersonal outcomes. Fortunately, our results suggest a target for intervention: Training in warm, relationship-building behaviors (cf. Alden and Taylor, 2011) might allow people with higher social anxiety to navigate the social world more effectively by being willing to initiate new relationships in a more flexible and adaptive manner.

Acknowledgements

Funding for the study was provided to last author by the Canada Research Chairs Program and the Social Sciences and Humanities Research Council of Canada. Thanks to Ivana Lizek for helpful ideas and insights regarding interpersonal theory as related to this work.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.janxdis.2016.01.002.

References


