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Published in:
Journal of Abnormal Psychology

DOI:
[10.1037/abn0000415](https://doi.org/10.1037/abn0000415)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2019

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Fernández-Theoduloz, G., Paz, V., Nicolaisen-Sobesky, E., Perez, A., Buunk, A. P., Cabana, A., & Gradin, V. (2019). Social Avoidance in Depression: A Study Using a Social Decision-Making Task. *Journal of Abnormal Psychology*, 128(3), 234–244. <https://doi.org/10.1037/abn0000415>

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Social Avoidance in Depression: A Study Using a Social Decision-Making Task

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Depression significantly affects interpersonal functioning. Social avoidance may play an important role in depression, limiting opportunities and social skills acquisition, contributing to the maintenance of social difficulties. In the last few years, the need for studying social interactions using interactive tasks has been highlighted. This study investigated social avoidance in unmedicated depressed ($n = 26$) and matched healthy control ($n = 26$) participants, using a novel computerized social decision-making task (the TEAM task). In this task, participants choose between a social option (playing in a team with a coplayer) and an individual option (playing alone). Although the social option is more profitable from a material point of view, it can also be challenging because of social comparison and guilt feelings for failing the team. It was found that the higher the rank of the coplayer, the stronger the negative emotions (shame, guilt) reported by participants and the more they opted for the individual option. Depressed participants reported significantly less positive (happiness) and more negative (shame, guilt, disappointment) feelings regarding the task. Importantly, depressed participants chose the individual option significantly more often than controls, which led to lower gains in this group. Furthermore, as the task progressed, controls selected the individual option less often, whereas depressed participants selected the individual option more often. Our findings illustrate the importance of social avoidance in depression and how this behavior can lead to negative consequences. They also highlight the role of social comparison and guilt-related processes in underlying social avoidance in depression.

General Scientific Summary

In this study, we used a novel computerized social decision-making task to investigate social avoidance in depression. Our findings suggest that social avoidance plays a key role in depression, limiting individuals from opportunities and contributing to poor life quality. Furthermore, this study supports the notion that social comparison and guilt-related processes may underlie social avoidance in depression.

Keywords: depression, social comparison, social avoidance, social decision making

Supplemental materials: <http://dx.doi.org/10.1037/abn0000415.supp>

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The study was approved by the Research Ethics Committee of the School of Psychology, Universidad de la República (Comité de Ética en Investigación de la Facultad de Psicología, Universidad de la República; protocol: 191175-001397-14). Special thanks to all of the volunteers who

participated in the research and to the Center for Basic Research in Psychology. This study was funded by Comisión Sectorial de Investigación Científica, Universidad de la República (Uruguay), and a Master Scholarship from the Comisión Académica de Posgrados, Universidad de la República to Gabriela Fernández-Theoduloz. Álvaro Cabana and Victoria B. Gradin were funded by Universidad de la República, Agencia Nacional de Investigación e Innovación, and the Programa de Desarrollo de las Ciencias Básicas (PEDECIBA). The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

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Depression is a prevalent disorder, ranked among the leading causes of disability worldwide (Kessler & Bromet, 2013). Crucially, depression has a profound impact on interpersonal functioning. People with depression report poor participation in social activities, having less support from social networks, poor social skills, difficulties in being assertive, poor intimate relationships, being unconfident and displaying excessive reassurance seeking, and, in general, not enjoying but rather suffering through social interactions (Joiner & Timmons, 2009). Classic studies of social cognition in individuals with mental disorders have mostly used self- and observer-based questionnaires to study social interactions (Lis & Kirsch, 2016) as well as facial emotion perception or theory-of-mind tasks (Kohler, Hoffman, Eastman, Healey, & Moberg, 2011). Although these approaches provide useful information, they do not assess active social interactions. In the last few years, there has been growing recognition of the importance of studying social interactions in relation to mental disorders (King-Casas & Chiu, 2012) and, more specifically, in depression (Gradin et al., 2015, 2016; Kupferberg, Bicks, & Hasler, 2016; Pulcu & Elliott, 2015; Wang, Yang, Li, & Zhou, 2015), using paradigms such as behavioral economic tasks (Hasler, 2012) as well as other interactive tasks (Kupferberg, Hager, et al., 2016; Silk et al., 2014) that allow active social exchanges.

It has been hypothesized that avoidance (Ferster, 1973; Lewinsohn, 1974), and in particular, *social* avoidance (defined as the tendency to keep away from social situations; Goossens, 2014), play a crucial role in depression (Trew, 2011). It has also been suggested that depression is associated with low assertiveness, social withdrawal, avoidance, and shyness (Joiner, 2000). Although social avoidance of interpersonal conflict may prevent the experience of negative outcomes, it may also result in the loss of social and material opportunities, lead to isolation, and prevent the individual from improving social skills and from learning how to deal with interpersonal problems (Joiner, 2000; Joiner & Timmons, 2009; Trew, 2011). In the long run, this may contribute to maintaining social difficulties and depression (Trew, 2011). Recent work (Ottenbreit, Dobson, & Quigley, 2014; Trew, 2011) has noted that although the construct of avoidance has received considerable attention in the study of anxiety disorders, it has been underemphasized in research on depression. Empirical studies are limited and have mostly used rating scales based on self-report questionnaires (Ottenbreit et al., 2014). This highlights the need for empirical research exploring avoidance in depression by using social decision-making tasks.

Here, we have developed a computerized social decision-making task (the TEAM task) to investigate social avoidance in depression. This task was inspired by real-life situations in which one has to choose between doing something as part of a team (social option) or doing something individually (individual option). An example of this kind of situation would be the case of a student who has to decide between doing a course assignment with a partner or individually. Although the social option may have advantages (i.e., learning from someone else, sharing the workload), it may also bring some drawbacks. For example, if the student perceives the partner as being brighter than her/him, this could lead to worries about not being good enough. In addition, he/she could be anticipating feelings of guilt for letting his/her partner down. If the negative cognitions and negative affect are relatively strong, the student might choose to do the assignment

individually despite the loss of benefits. Examples of this kind of situation can be found in a wide variety of daily life activities, including work but also leisure activities such as sports or hobbies.

In the TEAM task, there are two elements that could contribute to social avoidance. First, teaming up with a partner that is perceived as superior may elicit thoughts such as “I’m not good enough.” This may trigger social comparison processes. Social comparison is a central feature of human social life, vital for human adaptation and survival, as it allows one to assess abilities and aptitudes (Buunk & Gibbons, 2007; Festinger, 1954). Comparing oneself with others is a continuous process that can even happen automatically without awareness (Swallow & Kuiper, 1988). In this framework, *downward social comparison* is defined as comparing oneself with those who are considered to be worse, whereas *upward comparison* refers to comparing oneself with those who are considered to be better. Downward comparison is usually associated with positive emotions such as relief. On the other hand, although upward social comparison can be helpful in providing information to assess and eventually improve our abilities, it can also be threatening, representing a chance for highlighting personal flaws and inadequacies (Swallow & Kuiper, 1988).

According to cognitive theories (Beck, 1979; Disner, Beevers, Haigh, & Beck, 2011), depression is characterized by a bias toward negativity in information processing and thinking. In particular, depression has been associated with a negative view of the self, with depressed individuals typically devaluing themselves, often being highly critical regarding their own abilities and in general seeing themselves as worthless and inadequate (Swallow & Kuiper, 1988). It has been proposed that social comparison could act as a trigger to the negative self-evaluations characteristic of depression, contributing to the etiology and maintenance of the disorder (Ahrens & Alloy, 1997; Buunk & Brenninkmeijer, 2000; Swallow & Kuiper, 1988). Furthermore, it is thought that social comparison could underlie the social withdrawal and self-imposed isolation typical of depression (Swallow & Kuiper, 1988). Following this line of thought, we hypothesized that in the TEAM task, depressed individuals would show an enhanced social avoidance response partly mediated by social comparison processes.

There is a second element that could contribute to social avoidance during the TEAM task. Apart from feeling that they are not as good as their partners, participants may also experience guilt related to viewing themselves as a liability for the team, and as a consequence may decide to go for the individual option. Excessive feelings of guilt are a key symptom of depression (American Psychiatric Association, 1994), and several studies using scales for measuring the construct of guilt have shown that individuals with depression experience elevated levels of guilt (Berrios et al., 1992; Ghatavi, Nicolson, MacDonald, Osher, & Levitt, 2002; O’Connor, Berry, Weiss, & Gilbert, 2002; Pulcu, Zahn, & Elliott, 2013). Based on this, we expected that, in the TEAM task, enhanced feelings of guilt in depressed individuals would also contribute to an increased social avoidance response.

In summary, we developed a social decision-making task that allows measuring social avoidance. We predicted that during the TEAM task, outcomes in which the participant had a good performance would be associated with positive feelings, whereas outcomes in which the participant had a poor performance would be associated with negative feelings such as guilt and shame, particularly in cases in which the coplayer had done well. Regard-

ing between group comparisons, it was hypothesized that depressed participants would show lower positive feelings because of anhedonia symptoms (Pizzagalli, 2014) and enhanced negative feelings, such as guilt and shame, in response to the task. Crucially, it was also expected that depressed participants would show an enhanced social avoidance response during the TEAM task compared with control volunteers. To our knowledge, this is the first study investigating social avoidance behavior in depression using a computerized social decision-making task.

Method

Participants

The study was approved by the Research Ethics Committee from the School of Psychology, Universidad de a República (Comité de Ética en Investigación de la Facultad de Psicología, Universidad de la República; protocol number: 191175–001397-14). Written informed consent was obtained from all participants. Data were acquired from participants with depressive symptoms and healthy controls. The study was advertised through the university's social networks. Those who were interested in taking part completed the Spanish version of the Beck Depression Inventory-II (BDI-II; Beck, Ward, & Mendelson, 1961; Sanz, Perdigón, & Vázquez, 2003) on a website and were invited to self-nominate either for the depression or control group. Applicants who self-nominated for the depression group and had a score ≥ 16 on the BDI-II, as well as applicants from the control group who scored below 16 on the BDI-II, were invited to a recruitment session. In this session, volunteers were screened for depression and other psychiatric symptoms using the Spanish version of the MINI International Neuropsychiatric Interview (reliability measured as Cohen's kappa coefficient > 0.80 for major depressive disorder [Mordal, Gundersen, & Bramness, 2010]; in the current study, reliability of the MINI Plus was not assessed [Ferrando et al., 2000; Sheehan et al., 1998]). In addition, during the interview, participants were screened using the BDI-II. Inclusion criteria for the depression group were: satisfying the Diagnostic and Statistical Manual of Mental Disorders (4th edition; American Psychiatric Association, 1994) criteria for an episode of depression, a score ≥ 16 on the BDI-II (this requirement had to be met on three occasions: when they completed the BDI on the website, in the recruitment session, and in the experimental session) and at least 3 weeks of not taking psychiatric medication. Participants in the control group had no current or past history of depression or any other psychiatric disorder. One depression participant and one control participant were excluded from the analysis for not believing in the task "cover story" (see paradigm description in the Methods section). The final sample consisted of 52 participants, 26 in each group. All participants were female, and the groups did not differ in age, study area, or years of education (see Table 1 for details). Participants were assessed with several psychological rating scales (see the online supplemental materials and Table 1 for details).

The TEAM Task

A social decision-making behavioral task (see Figure 1) was developed to assess social decision making. Participants were told that they would be playing a game with real people through a computer network, and that two of those coplayers were in nearby

Table 1
Participant Characteristics

Demographic and psychological variables	Control	Depression	<i>p</i>
<i>n</i>	26	26	
Age	24.03 \pm 4.54	25.51 \pm 4.77	.25 ^a
Years of education	14.85 \pm 1.85	15.1 \pm 2.43	.56 ^a
Area of education			
Technology and science	2	2	
Health science	14	14	
Social science and arts	10	10	
BDI-II	1.23 \pm 1.68	29.54 \pm 8.59	<.001
BDI-II—Guilt subscore	.08 \pm .272	1.58 \pm .758	<.001
PSI			
Sociotropy	68.12 \pm 15.25	93.19 \pm 13.30	<.001
Autonomy	68.12 \pm 14.69	91.77 \pm 11.05	<.001
IIP-64			
Total	54.27 \pm 23.02	104.73 \pm 32.83	<.001
Domineering/controlling	7.35 \pm 5.28	9.50 \pm 5.62	.16 ^a
Vindictive/self-centered	4.12 \pm 2.76	8.96 \pm 6.85	<.005
Cold/distant	3.46 \pm 3.43	10.19 \pm 6.56	<.001
Socially inhibited	4.54 \pm 4.04	16.19 \pm 8.26	<.001
Nonassertive	7.50 \pm 4.33	18.42 \pm 6.81	<.001
Overly accommodating	9.38 \pm 4.21	15.62 \pm 6.03	<.001
Self-sacrificing	11.50 \pm 5.74	16.58 \pm 5.76	.003
Intrusive/needy	6.42 \pm 4.01	9.27 \pm 6.41	.06 ^a
STAI			
Trait	12.08 \pm 5.5	42.08 \pm 6.95	<.001
State	8.73 \pm 7.7	32.27 \pm 11.12	<.001
LSAS			
Total	21.88 \pm 14.13	64.56 \pm 23.53	<.001
Fear/Anxiety scale	11.5 \pm 7.97	32.92 \pm 11.51	<.001
Avoidance scale	10.38 \pm 7.16	31.64 \pm 13.1	<.001
RSES	35.27 \pm 3.37	21.62 \pm 4.23	<.001
SSES			
Total	86.35 \pm 6.54	53.46 \pm 15.40	<.001
Performance	31.04 \pm 2.39	18.85 \pm 5.73	<.001
Social	33.12 \pm 1.93	20.81 \pm 6.72	<.001
Appearance	22.19 \pm 3.5	13.81 \pm 5.44	<.001
PANAS			
Positive Affect	34.65 \pm 6.55	18.88 \pm 3.82	<.001
Negative Affect	17.00 \pm 2.32	28.42 \pm 7.46	<.001
INCOM	29.73 \pm 4.69	37.19 \pm 4.00	<.001

Note. Values are given as $M \pm SD$; *p* values are based on independent-samples *t* test. BDI = Beck Depression Inventory (scores from the experimental session); PSI = Personal Style Inventory; IIP = Inventory of Interpersonal Problems; STAI = State-Trait Anxiety Inventory for Adults; LSAS = Liebowitz Social Anxiety Scale; RSES = Rosenberg Self-Esteem Scale; SSES = State Self-Esteem Scale; PANAS = Positive Affect Negative Affect Scale; INCOM = Iowa-Netherlands Comparison Orientation Measure.

^a No significant difference between groups.

labs doing the same procedure with other researchers. In reality, the task was preprogrammed and there were no real coplayers. Participants were instructed on how to perform the TEAM task. First, they were taught how to perform a time-estimation test (Boksem, Kostermans, & De Cremer, 2011; Figure 1a). In this test, a red circle is shown; then, a sky-blue circle appears replacing the red one, and participants have to press the spacebar between 500 ms and 1,000 ms after the color changed. Participants were told that depending on how well they did on the test, they could be ranked as a three-, two-, or one-star player, with the three-/one-star player being the most/least accurate. Participants were told that the two coplayers that were in nearby labs were going to perform the

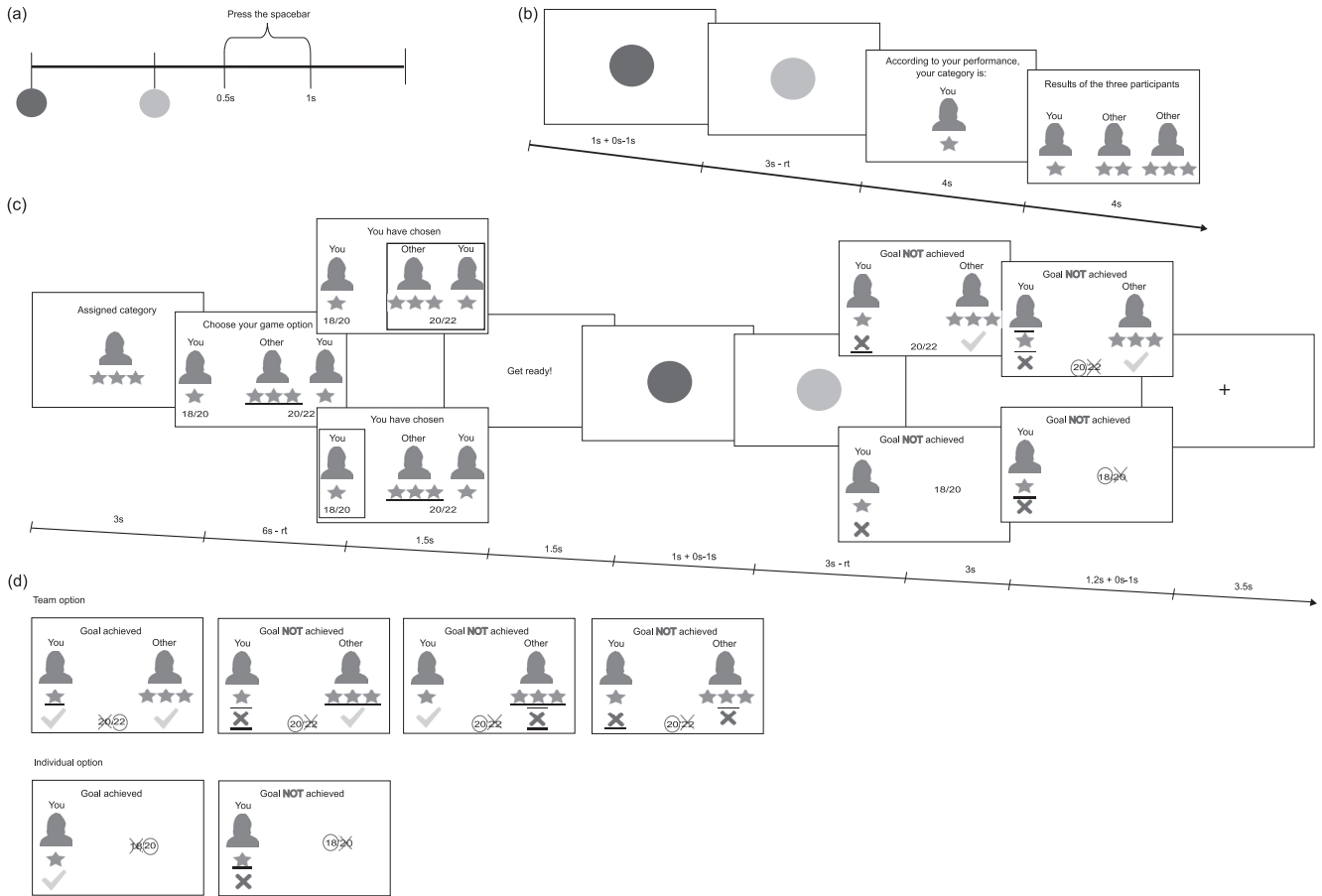


Figure 1. The TEAM task. (a) Timeline of the time-estimation test. (b) Establishment of a social hierarchy. (c) Example of a trial. (d) Payoff matrix. RT = reaction time. The original version in Spanish is provided in the online supplemental materials (Figure S1).

test at the same time and that the three of them were going to see each other’s rankings at the same time. The outcome of the test was preprogrammed and participants always received one star, while the other two coplayers were classified as a two-star and a three-star player (Figure 1b). Thus, this first part of the task created a social hierarchy (Zink et al., 2008), with participants always being ranked at the bottom. This procedure was implemented to facilitate upward social comparisons during the task (i.e., more occasions in which the participant performed the test incorrectly while the coplayer did it well).

After establishing the social hierarchy, the core part of the TEAM task would begin (Figure 1c). In each trial, the participant had to choose between playing with a coplayer (social option) or playing individually (individual option). Depending on the trial, the coplayer could be a one-, two-, or three-star player. In case of choosing the social option, the participant would be paired with a coplayer of the category allocated to the trial. Furthermore, participants were told that they would be paired with a coplayer who had also accepted playing with a coplayer of the participant’s rank. Thus, all players were supposed to make the same kind of decisions and play the game in the same role. In the case of the social option, the participant had to perform the time-estimation test simultaneously with the coplayer, and the possible outcomes were

as follows: both did it correctly, one did it correctly and the other one did it incorrectly, and both did it incorrectly. In the first case, both earned 22 points, whereas in the remaining cases both players earned 20 points (Figure 1d). In case of choosing the individual option, the participant performed the time estimation test alone; if the test was performed correctly, she would earn 20 points, otherwise she would get 18 points. Note that from a purely material point of view, it was always better to choose the social option. However, as mentioned above, the social option implies social comparison and guilt-related processes that may induce participants to choose the individual option. It is worth mentioning that social comparison processes are present both at the decision time when the participant has to decide whether to make a team or not (depending on the hierarchy of the coplayer; Boksem, Kostermans, Milivojevic, & De Cremer, 2012; Wu, Zhou, van Dijk, Leliveld, & Zhou, 2011; Zink et al., 2008) as well as in the outcome time when the performances of the two players are shown (Boksem et al., 2011; Kedia, Mussweiler, & Linden, 2014; Ma et al., 2011; Qi, Raiha, Wu, & Liu, 2018; Qiu et al., 2010; Wu, Zhang, Elieson, & Zhou, 2012).

The participant was told that if, during the game, there had been trials where she ended up playing in a team with one of the

participants that were in nearby labs, at the end of the session, she would be introduced to this coplayer. This procedure was implemented to reinforce the social aspect of the task. Furthermore, studies have shown that social comparison processes depend on whether the participant anticipates actual contact with the comparison other (Buunk & Gibbons, 2007).

The task was programmed using Psychopy (Peirce, 2007, 2009) and had three types of trials, corresponding to whether the participant could play with a coplayer who had one, two, or three stars. Subjects performed 45 trials of the task, 15 in each condition, for about 18 min. Outcomes were manipulated so that three-star coplayers had a 100% rate of correct responses in the time-estimation test, two-star coplayers had a 60% rate, and one-star coplayers had a 30% rate. As the participant was a one-star player, she had a 30% rate of correct responses. Thus, participants performance in the time estimation test was fixed.

After finishing the task, participants rated their subjective emotional reaction to the different situations they faced during the task: the possibility of having coplayers of each category, the outcomes of the trials, and the possibility of meeting other participants. Participants rated the emotions of happiness, anger, sadness, guilt, shame, and disappointment on a 9-point Likert scale.

At the end of the session, participants were debriefed. None of the participants manifested discomfort regarding the cover story. All participants received the same reward (a cinema ticket).

Analysis of Behavioral Data and Emotional Responses to the Task

Binary logistic generalized linear models were used to analyze participants' decisions during the game. Generalized estimated equations were used to estimate model parameters, thus adjusting for correlations related to repeated observations within each participant over the trials. We used a logit link function and assumed an exchangeable working correlation structure. The statistical significance level was set at .05. The participant's decision (playing individually or with a coplayer) was entered as the binary dependent variable. The variable subject was entered as a repeated effect variable and group as a fixed effect variable. Trial number and trial type (having the possibility of playing with a one-, two-, or three-star coplayer) were set as covariates. Group, trial number, and trial type main effects were explored. Also, the following interactions were set in the model: Group \times Trial Number, Group \times Trial Type, Trial Number \times Trial Type, and Group \times Trial Number \times Trial Type. Effect size is presented as the odds ratio (*OR*) for the group variable.

A mixed ANOVA was used to examine the effect of group and game type (playing with a one-, two-, or three-star coplayer or individually) on emotional responses about having to play in these four situations. A mixed ANOVA was used to examine the effect of group and trial outcome (for the social option) on emotional responses when facing those outcomes. Effect size was calculated using partial eta squared (η_p^2).

Results

Clinical Ratings

Between-groups *t* tests were used to study the differences between the depression and control groups in the clinical ratings.

Depressed participants scored higher than controls on measures of depression, anxiety, social anxiety, and negative affect, while scoring lower on measures of self-esteem and positive affect. The depression group also scored significantly higher in sociotropy and autonomy and in social comparison orientation. In addition, as in previous studies (Gradin et al., 2015), the depression group scored significantly higher in interpersonal problems in the following domains: vindictive/self-centered, cold/distant, socially inhibited, nonassertive, overly accommodating, and self-sacrificing (see Table 1).

Behavioral Results

The generalized linear model identified a significant main effect of group on decision making, $\chi^2(1, N = 52) = 10.755, p = .001, OR = 3.61, 95\%$ confidence interval [CI] [1.68, 7.75], with depressed participants choosing the individual option significantly more often than controls. As a consequence, depressed participants earned a lower number of points during the task compared with controls ($p = .007$; see Figure 2a and Supplementary Table S2 of the online supplemental materials). In addition, a significant interaction between group and trial number was found, Wald $\chi^2(2, N = 52) = 9.627, p = .002$. This was related to the fact that control participants selected the individual option less often as the task went on, whereas depressed participants exhibited the opposite behavioral pattern (see Figure 2b). Also, a marginally significant main effect of trial-type, $\chi^2(1, N = 52) = 3.557, p = .059$, was found, with participants choosing more often the individual option the higher the number of stars of the coplayer. All other effects and interactions were not significant (see the online supplemental materials for analyses on reaction times).

Additionally, we tested a regression model without interaction terms to simplify the interpretation of the main effects of group, trial number, and trial type. This analysis yielded significant effects for group, $\chi^2(1, N = 52) = 10.428, p = .001$, and trial type, $\chi^2(2, N = 52) = 3.935, p = .047$, and no significant effect for trial number.

As some of the depressed participants also experienced symptoms of social anxiety, which strongly relate to social avoidance, we performed additional analyses, controlling for social anxiety levels measured with the Liebowitz Social Anxiety Scale (Liebowitz, 1987). These analyses also yielded significant results for the effects of group and the group \times trial number interaction (see the online supplemental materials for details on these analyses).

Emotional Response

Emotions related to each of the task game types. After performing the TEAM task, participants rated their emotions (i.e., happiness, shame, guilt, anger, and sadness) about having to play in each of the game types (i.e., playing with a one-, two-, or three-star coplayer or individually; Figure 3a and Supplementary Table S3 of the online supplemental materials).

For the emotion of happiness, a significant main effect, $F(1.381, 69.035) = 11.185, p < .001, \eta_p^2 = .183, 95\%$ CI [.04, .33], and a significant linear trend, $F(1, 50) = 10.896, p = .002, \eta_p^2 = .179, 95\%$ CI [.03, .35], were found for game type. Post hoc pairwise comparisons after Bonferroni correction identified significant differences in happiness between the social and the individual games, with the social games eliciting higher happiness than the individual

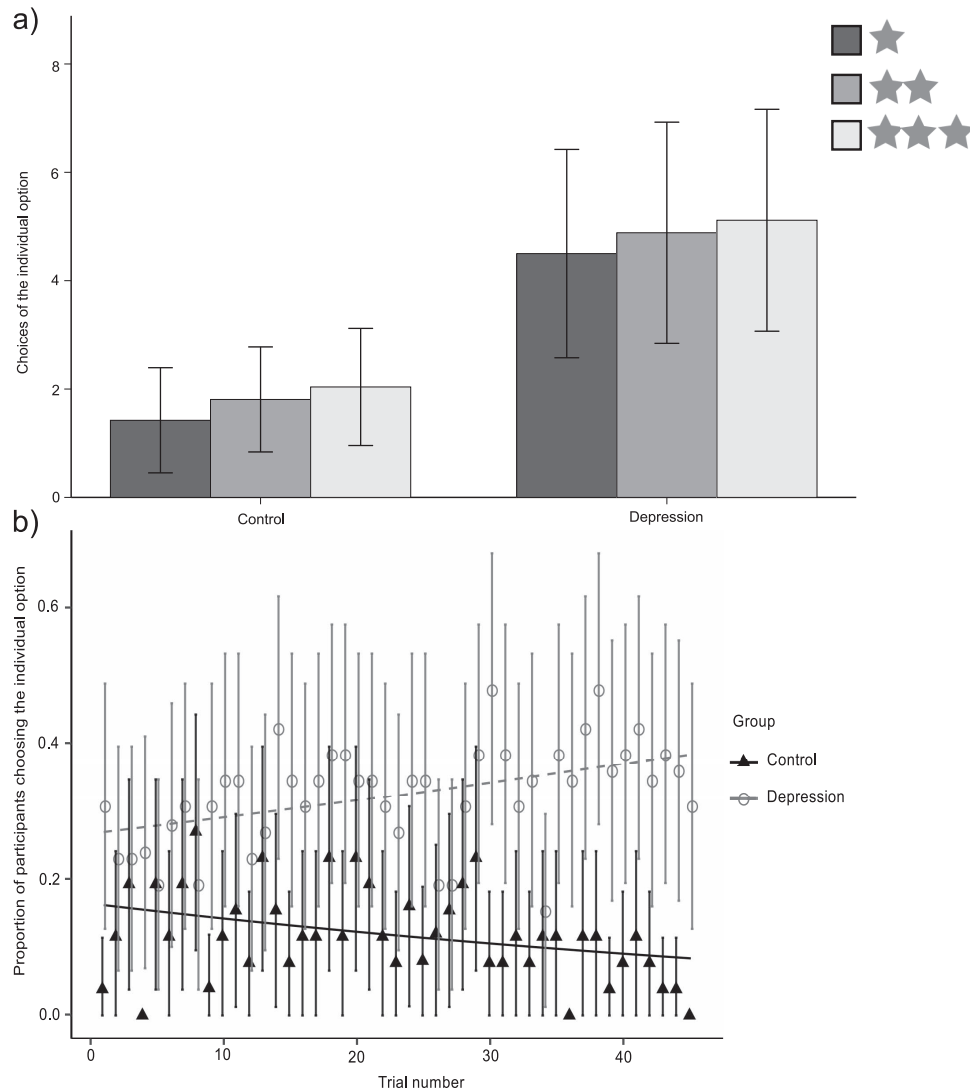


Figure 2. Behavioral results. (a) Participants more often chose the individual option the higher the stars of the coplayer. Depressed participants chose the individual option significantly more often than controls. Error bars denote 95% confidence intervals. (b) Control participants selected the individual option less as the task progressed, whereas depressed participants did not show this behavior. Lines show mean values predicted by the model. Error bars denote 95% confidence intervals.

game ($p \leq .006$). A significant main effect of group was also found, $F(1, 50) = 9.334$, $p = .004$, $\eta_p^2 = .157$, 95% CI [.02, .33], with the control group reporting higher happiness than the depression group.

For the emotion of shame, a significant main effect, $F(1.457, 72.864) = 12.671$, $p < .001$, $\eta_p^2 = .202$, 95% CI [.06, .35], and a linear trend, $F(1, 50) = 16.136$, $p < .001$, $\eta_p^2 = .244$, 95% CI [.06, .42], for game type were found, with the three-star coplayer eliciting more shame than the other game types and, in turn, the two-star coplayer eliciting more shame than the one-star coplayer and the individual game ($p \leq .023$). A significant main effect of group was found, $F(1, 50) = 15.458$, $p < .001$, $\eta_p^2 = .236$, 95% CI [.06, .41], with the depression group reporting more shame than controls.

For the emotion of guilt, a significant main effect, $F(1.614, 80.711) = 6.165$, $p = .006$, $\eta_p^2 = .110$, 95% CI [.01, .24], and linear trend, $F(1, 50) = 8.170$, $p = .006$, $\eta_p^2 = .140$, 95% CI [.01, .31], were found for the game type, with the three-star coplayer eliciting more guilt than playing individually ($p = .033$).

The remaining effects and interactions were not found significant.

Emotions related to each of the task outcomes. Participants reported their emotions regarding the task's outcomes for the social option (Figure 3b and Supplementary Table S3 of the online supplemental materials).

For the emotion of happiness, a significant main effect of outcome was found, $F(2.236, 111.814) = 70.276$, $p < .001$, $\eta_p^2 = .584$, 95% CI [.46, .66], with the outcome "You correct, Other

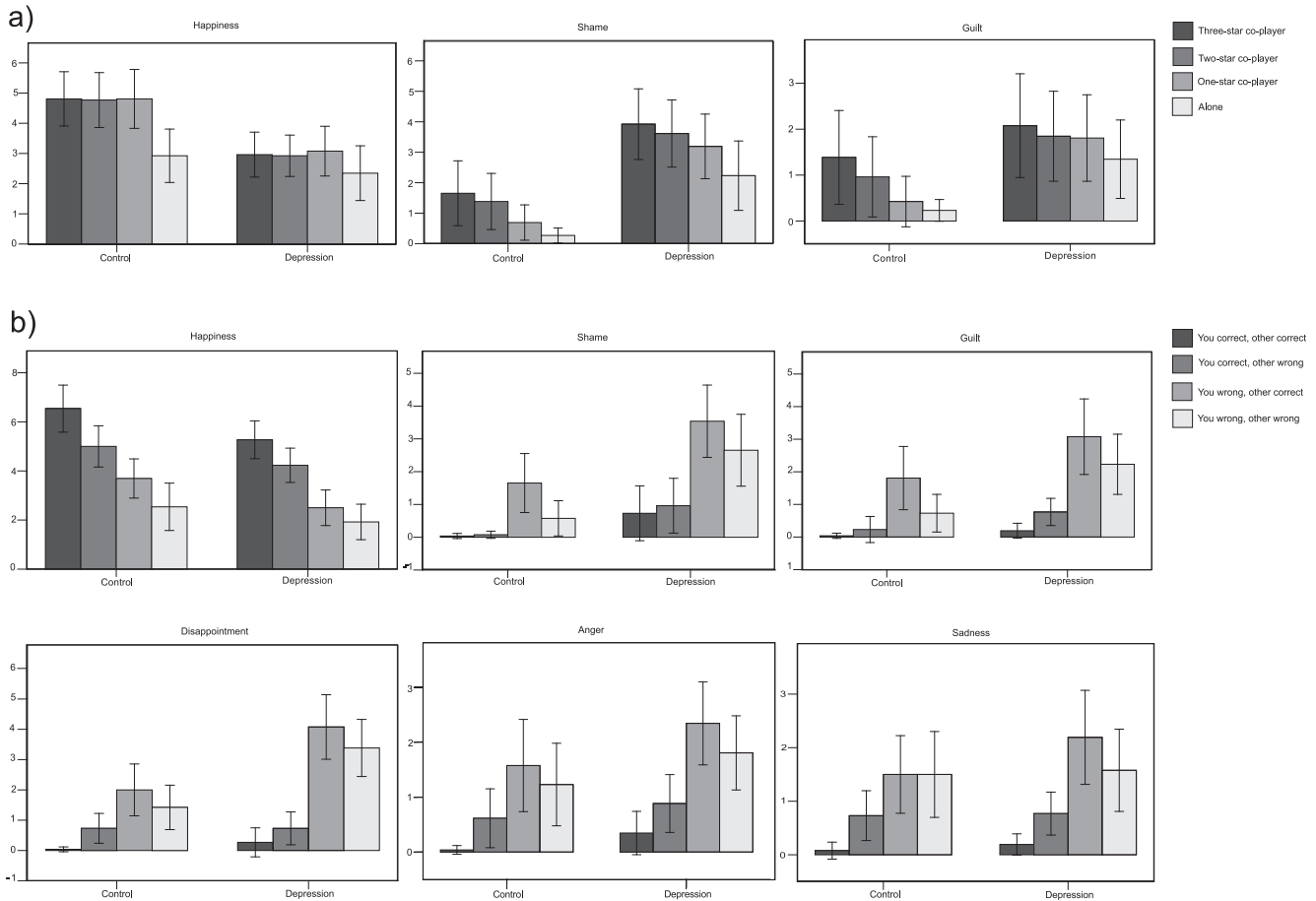


Figure 3. Emotional responses to the TEAM Task. (a) Emotional responses for each game type. Error bars denote 95% confidence intervals. (b) Emotional responses for the social outcomes. Error bars denote 95% confidence intervals.

correct” eliciting the highest happiness, followed by “You correct, Other wrong,” then by “You wrong, Other correct,” and, finally, by “You wrong, Other wrong” ($p \leq .012$).

A significant main effect of outcome was found for the emotions of shame, $F(1.615, 80.763) = 31.724, p < .001, \eta_p^2 = .388, 95\% \text{ CI } [.22, .51]$, and guilt, $F(1.819, 90.958) = 25.732, p < .001, \eta_p^2 = .340, 95\% \text{ CI } [.18, .46]$, with the outcome “You wrong, Other correct” eliciting higher guilt and shame than the outcome “You wrong, Other wrong” ($p = .001$ for shame; $p = .008$ for guilt), and this outcome, in turn, eliciting more shame and guilt than the remaining outcomes ($p \leq .002$).

There was also a significant main effect of outcome for the emotions of disappointment, $F(1.852, 92.614) = 43.546, p < .001, \eta_p^2 = .466, 95\% \text{ CI } [.31, .57]$, anger, $F(2.096, 104.788) = 25.327, p < .001, \eta_p^2 = .336, 95\% \text{ CI } [.18, .45]$, and sadness, $F(1.776, 88.791) = 24.464, p < .001, \eta_p^2 = .329, 95\% \text{ CI } [.17, .45]$, with the outcomes in which the participant performed poorly eliciting more disappointment, anger, and sadness than the outcomes in which the participant performed well ($p < .005$).

A significant main effect of group was found for happiness, $F(1, 50) = 4.617, p = .037, \eta_p^2 = .085, 95\% \text{ CI } [.0, .25]$, shame, $F(1, 50) = 10.149, p = .002, \eta_p^2 = .169, 95\% \text{ CI } [.02, .34]$, guilt,

$F(1, 50) = 7.452, p = .009, \eta_p^2 = .130, 95\% \text{ CI } [.01, .30]$, and disappointment, $F(1, 50) = 10.191, p = .002, \eta_p^2 = .169, 95\% \text{ CI } [.02, .35]$, with the depression group reporting less happiness and more shame, guilt, and disappointment than controls. For shame a significant interaction was found, $F(1.615, 80.763) = 3.587, p = .041, \eta_p^2 = .067, 95\% \text{ CI } [.00, .18]$, with depressed participants reporting significantly more shame for the outcomes “You wrong, Other correct” ($p = .009$), “You wrong, Other wrong” ($p = .001$), and “You correct, Other wrong” ($p = .035$), but not for the outcome “You correct, Other correct.” For disappointment, a significant interaction was also found, $F(1.852, 92.614) = 7.161, p = .002, \eta_p^2 = .125, 95\% \text{ CI } [.02, .25]$, with depressed participants reporting more disappointment than controls for the outcomes in which the participant performed poorly ($p = .003$) but not for the outcomes in which the participant performs correctly.

The remaining effects and interactions were not significant.

Emotions related to a possible encounter with coplayers. Depressed participants reported less happiness, $t(50) = -4.780, p < .001, d = -1.35, 95\% \text{ CI } [-4.315, -1.762]$, and more sadness, $t(50) = 2.439, p = .018, d = 0.69, 95\% \text{ CI } [.2, .2.03]$, shame, $t(50) = 4.327, p < .001, d = 1.22, 95\% \text{ CI } [1.57, 4.28]$,

and disappointment, $t(50) = 3.062$, $p = .004$, $d = 0.87$, 95% CI [.06, 2.87], about the possibility of meeting their coplayers in comparison to controls (see [Supplementary Table S3](#) of the online supplemental materials).

Within the depression group, we searched for correlations between decision making and emotional reports, but no significant correlations were found.

Discussion

Effect of the Coplayer Rank on Emotional and Behavioral Responses

It was found that when playing with a higher ranking coplayer, participants reported higher negative emotions about having to play with that kind of coplayer. Behaviorally, a marginally significant effect was found, with participants more frequently choosing the individual option the higher the rank of the coplayer. From a purely material point of view, this would not be reasonable, as the higher the rank of the coplayer, the higher the chances for the team earning the maximum number of points. However, the higher the rank of the coplayer, the higher also the chances of the participant ending up in the situation in which she performs poorly while the coplayer performs well. This situation implies an upward social comparison plus dealing with the fact that the team has not reached its maximum because of the participant's fault. In agreement with this, participants reported the highest levels of shame and guilt for this outcome of the task. Thus, the negative feelings related to the anticipation of this outcome seem to be driving the increased social avoidance response the higher the rank of the coplayer.

These findings are in line with research indicating that upward social comparison can be experienced in a negative way (Buunk & Gibbons, 2007) that increases negative affect (Fuhr, Hautzinger, & Meyer, 2015). Our findings are also in line with research indicating that anticipation of guilt feelings for letting other people down may lead individuals to avoid forming interdependent partnerships with people they see as more competent than themselves (Wilermuth & Cohen, 2014).

Effect of Depression on Emotions and Decision Making

Depressed and control volunteers differed in the way they reacted to the TEAM task. In particular, depressed participants reported higher feelings of shame for all social outcomes except for when both participant and coplayer performed well, higher levels of disappointment when having a bad performance, and less happiness and more sadness, shame, and disappointment about the possibility of meeting their coplayers. Crucially, regarding decision making, depressed volunteers showed an increased social avoidance response, choosing the individual option significantly more often than controls. Furthermore, it was observed that whereas control participants selected the individual option less frequently as the task went on, depressed participants showed the opposite behavior, selecting the individual option more frequently as the task progressed. This suggests that although the balance between the attractiveness and the challenge of the social option was more positive for controls as the task went on, depressed participants did not show the same kind of learning.

These findings are in agreement with the proposal that avoidance (Blalock & Joiner, 2000; Ferster, 1973; Lewinsohn, 1974; Spurrell & McFarlane, 1995), and especially social avoidance (Joiner, 2000), is a key aspect of depression. Our findings are also in line with studies reporting an association between avoidance and depression by using self-reported questionnaires (Ottenbreit et al., 2014; Quigley, Wen, & Dobson, 2017).

Although social avoidance, and especially avoidance of interpersonal conflict, may preclude individuals from experiencing negative interpersonal outcomes, it may contribute to depression in several ways (Joiner, 2000). First, interpersonal avoidance may result in the loss of social and material opportunities, and loss is an important trigger for depression (Heikkinen et al., 1997). Second, interpersonal avoidance may imply a diminution in social reinforcement and social support. Finally, social avoidance may lead to isolation and decreased social skills acquisition and learning, further contributing to interpersonal problems and the maintenance of depression (Lewinsohn, 1974; Trew, 2011).

One factor that makes the social option stressful is that it implies social comparison processes. Thus, an increased sensitivity to social comparison in depression could be contributing to the increased negative emotions and enhanced social avoidance observed in this group. This is in agreement with a theory (Swallow & Kuiper, 1988) that postulates social comparison as a trigger for negative self-evaluations and social withdrawal in depression. Our findings are also in agreement with several studies indicating that dysphoric subjects interpret social comparison information in a less self-serving way and that they focus on the fact that others are better off than they are, confirming their low rank and status (Buunk & Brenninkmeijer, 2000), and with a study showing that when facing an imaginary upward comparison, depressed individuals show a stronger decrease in positive affect compared with controls (Bäzner, Brömer, Hammelstein, & Meyer, 2006).

Other approaches have also linked social comparison with depression (Buunk & Brenninkmeijer, 2000). In the context of the involuntary subordinate strategies theory (Price, Sloman, Gardner, Gilbert, & Rohde, 1994), depression is understood as a state of involuntary subordination, characterized by a sense of defeat, frustration, and hopelessness; a lack of challenging and exploratory behavior; and the use of strategies signaling acknowledgment of one's low status. From this perspective, the enhanced social avoidance response that we observed in depressed individuals could be interpreted as a deficit in challenging and exploratory behavior as well as a signal of no threat. In the same line, a recent study showed avoidance of competitive situations in depression (Kupferberg, Hager, et al., 2016).

Using the self-reported rating scale Iowa-Netherlands Comparison Orientation Measure (INCOM; Gibbons & Buunk, 1999), we found that depressed participants obtained a higher score in social comparison orientation compared with controls. Social comparison orientation refers to the disposition that a person has to compare herself with others. It has been suggested that especially those individuals with a high degree of uncertainty about themselves and a tendency to focus attention on the self, such as people with low self-esteem, depression, or high neuroticism, would be particularly likely to engage in social comparison processes (Gibbons & Buunk, 1999). Our finding of a higher social comparison score in depressed participants is consistent with this hypothesis as well as with a previous study also reporting an increased social compari-

son orientation in depression using the INCOM scale (Bäzner et al., 2006). This suggests that depressed participants are more concerned and spend more time and energy ruminating about their standing relative to others. This supports the notion that the increased social avoidance response observed during the TEAM task in depression relates to avoiding self-evaluative information to prevent discomfort and is not because of a lack of interest in social comparison information.

Apart from social comparison processes, social avoidance during the TEAM task may also be driven by anticipation of guilt feelings for an eventual poor performance leading to the team not earning the maximum number of points. In our study, depressed participants reported higher feelings of guilt in relation to the task compared with controls, and enhanced feelings of guilt are a typical symptom of depression (American Psychiatric Association, 1994). Thus, although no significant correlation was found between guilt feelings and decision making within the depression group, it is likely that anticipation of guilt feelings for failing the team may be contributing to an enhanced social avoidance response in this group. This is in agreement with evidence showing that highly guilt-prone individuals are more likely to anticipate negative feelings about letting team partners down by underperforming, and therefore avoid situations in which outcomes are interdependent with others whom they see as more competent (Wiltermuth & Cohen, 2014). Future studies should further explore the relationship between guilt feelings and social avoidance in depression.

Limitations

Possible limitations of the study should be noted. First, a university sample was used, which could limit generalizability of results. This recruitment method was used to facilitate recruitment of unmedicated depressed participants. Second, the sample consisted only of women, and so results may not be generalizable to men. Third, emotional responses were measured retrospectively. Thus, it is possible that differences in the recall of emotions may have contributed to the observed between group differences. One possibility for alleviating this would have been the implementation of online measures of emotions (i.e., measuring emotional reactions during the task, at the precise moments that events occur). However, interrupting the task to ask participants to reflect and answer on their emotions brings the drawback that it may affect the experience of the task (i.e., reflecting on how you feel and reporting how you feel may affect how you further perceive the task). Therefore, to preserve ecological validity, retrospective measures were applied instead of online measures of emotions. Fourth, future work might include a pre-post measure of emotions using a general scale, such as the Positive Affect Negative Affect Scale (Dufey & Fernández, 2012; Watson, Clark, & Tellegen, 1988), and a pre-post measure of guilt and shame, such as the Guilt and Shame Proneness scale (Cohen, Wolf, Panter, & Insko, 2011). Fifth, apart from showing symptoms of depression, our clinical sample also exhibited social anxiety symptoms. Although our findings remained significant after controlling for social anxiety levels, it is difficult to completely disentangle the effects of depression and social anxiety on social avoidance given the high levels of comorbidity. Alternatively, it would be interesting to study social avoidance within the Research Domain Criteria (US National Institute of Mental Health) framework, which under-

stands psychopathology in terms of fundamental components (e.g., executive functioning, affect regulation, person perception) that span the full range of human behavior from normal to abnormal instead of using the existing psychiatric categories (Sanislow et al., 2010; Woody & Gibb, 2015). Sixth, because the TEAM task is a novel instrument, further work on task validation would be of relevance. Finally, it would be interesting to test variations of the task, such as ranking the participant as a two-star player, and observe the preferences for upward or downward comparisons.

Conclusions

In summary, our study provides evidence for altered social decision making in depression using a social decision-making behavioral task. We observed that when having the possibility of playing in teams, unmedicated depressed participants opted more often than healthy controls to play alone, with this behavior leading to lower earnings. Our findings highlight the role of social avoidance in depression and how this behavior may lead to negative consequences and loss of opportunities in people's daily lives. Our study also highlights the role of social comparison and guilt-related processes in underlying social avoidance in depression.

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Received June 23, 2018

Revision received December 20, 2018

Accepted December 30, 2018 ■