Cyberostracism: Emotional and behavioral consequences in social media interactions

Ciberostracismo: Consecuencias emocionales y conductuales en las interacciones en redes sociales

Simona Galbava. Junior Researcher, Interdisciplinary Research Team on Internet and Society, Masaryk University (Czechia) (459829@mail.muni.cz) (https://orcid.org/0000-0002-5706-7105)

Dr. Hana Machackova. Associate Professor, Interdisciplinary Research Team on Internet and Society, Masaryk University (Czechia) (hmachack@fss.muni.cz) (https://orcid.org/0000-0001-9498-9208)

Dr. Lenka Dedkova. Postdoctoral Researcher, Interdisciplinary Research Team on Internet and Society, Masaryk University (Czechia) (ldedkova@fss.muni.cz) (https://orcid.org/0000-0002-0807-1183)

ABSTRACT

This study focuses on the effect of cyberostracism on social networking sites. Based on the temporal need-threat model of ostracism, we examined a) reflexive reactions, specifically worsened mood and threats to the four fundamental needs (i.e., belongingness, self-esteem, meaningful existence, and control), and b) reflective reactions, in the form of prosocial, antisocial, and avoidance behavior. We also focused on the role of social anxiety. Using the experimental tool Ostracism Online, we conducted an online experiment to manipulate ostracism, measure self-reported reflexive reactions, and measure reflective reactions in a newly developed cooperative financial game. The participants were 196 young Czech adults (age 18-30; 62% women). T-tests showed worsened mood and higher threat connected to all four of the fundamental needs in the reflexive stage in ostracized participants. Regression models showed that social anxiety had a small effect on reflexive reactions, but it did not moderate the effect of ostracism. The type of threatened need and social anxiety did not predict a reflective reaction. The only significant predictor of antisocial response was experienced ostracism. Even a mild form of ostracism such as the lack of reactions by strangers to a shared post can lead to negative emotional and behavioral consequences.

RESUMEN

Este estudio se centra en el efecto del ostracismo cibernético en los sitios de redes sociales. Sobre la base de un modelo de necesidad temporal-amenaza del ostracismo, analizamos el efecto en reacciones reflexivas, específicamente el empeoramiento del ánimo y amenaza a cuatro necesidades fundamentales (sentido de pertenencia, autoestima, existencia con sentido y control), y la reacción reflexiva en forma de comportamiento prosocial, antisocial o evasivo. También nos concentramos en el papel que desempeña la ansiedad social. Mediante el uso de la herramienta experimental Ostracism Online (Ostracismo en línea), realizamos un experimento en línea en el que se manipuló el ostracismo, se midieron las reacciones reflexivas autoinformadas en un juego financiero cooperativo recientemente desarrollado. Los participantes fueron 196 adultos jóvenes checos (de 18 a 30 años; 62% mujeres). T-tests demostraron empeoramiento del ánimo y amenaza más alta en las cuatro necesidades fundamentales en la etapa reflexiva de los participantes ostracidos. Los modelos de regresión mostraron que la ansiedad social tenía poco efecto en las reacciones reflexivas, pero no moderaba el efecto del ostracismo. El tipo de necesidad amenazada y ansiedad social no predijo la reacción reflexiva; el único indicador significativo de la respuesta antisocial fue el ostracismo experimentado. Incluso una forma leve de ostracismo en forma de falta de reacciones por parte de extraños a la publicación compartida puede dar lugar a consecuencias emocionales y conductuales negativas.

1. Introduction

Ostracism is a form of social exclusion in which one is ignored by others and is usually not acquainted with the reasons for such treatment. It is an unpleasant social phenomenon that leads to negative emotional and behavioral consequences, such as a worsened mood, a threat to fundamental needs, and antisocial coping behaviors (Williams, 2009). Since a significant part of today's social interactions happen online (Ryan et al., 2017), people encounter ostracism on the internet, particularly on social networking sites (SNS) and in other online environments that are focused on users' direct interactions (e.g., online discussions, games; Williams et al., 2000). To date, a large portion of research attention has been given to more direct forms of aggression and complex experiences of victimization (Kowalski et al., 2014). However, research which would specifically target this type of negative experience is scarce.

In our study, we intend to enrich current knowledge by focusing on the experience of cyberostracism in young adults. Specifically, we follow the line of research which used the experimental method proposed by Wolf et al. (2015), Ostracism Online (Schneider et al., 2017; Tobin et al., 2018). Moreover, we guide our research by Williams' (2009) temporal need-threat model of ostracism, which predicts the emotional reactions to the experienced ostracism and the behavioral response. By applying the experimental design to simulate the lack of reactions of others on adult participants, we intend to provide more evidence about reactions to cyberostracism. Specifically, we examined the reflexive reactions, like changes in mood and threats to the four fundamental needs, and reflective reactions, like prosocial and antisocial behavior. The study also focused on the role of social anxiety to better understand individual differences in the reactions to ostracism.

1.1. Cyberostracism

On SNS, ostracism can take the form of ignoring someone in a chat or a comments section (Donate et al., 2017; Tobin et al., 2015). However, people can feel excluded even with milder signs of ostracism, such as by not getting sufficient feedback on a shared post (Schneider et al., 2017; Tobin et al., 2018; Wolf et al., 2015). This often occurs because of the lack of usage of paralinguistic digital affordances (PDA; Hayes et al., 2016); in other words, one-click tools (e.g., a "Like" on Facebook, a "♥" on Instagram) commonly carry the meaning of support or, at least, validation of being noticed (Wohn et al., 2016). It has been shown that PDA acquisition can lead to pleasant feelings of happiness, self-worth, increased self-esteem, and higher satisfaction of the need to belong (Burrow & Rainone, 2017; Reich et al., 2018). Conversely, the lack of a reaction can lead to sadness (Hayes et al., 2016) and, as prior experimental studies have shown, ostracism, even within a group of strangers (Schneider et al., 2017; Tobin et al., 2018; Wolf et al., 2015).

Past research on cyberostracism often used versions of the virtual ball-tossing game called Cyberball (Williams et al., 2000). In it, the ostracized participant plays the game with two or three other online players. After a few initial tosses, they do not receive the ball again. Unfortunately, this situation does not strongly correspond to the current experiences of cyberostracism, especially on social media. For our study, we adapt the method proposed by Wolf et al. (2015) Ostracism Online. Ostracism Online simulates the conditions of getting insufficient feedback for shared content and better aligns with the experiences of cyberostracism. We use this new experimental method to examine the feeling of ostracism in young adults that is invoked by the lack of PDA reactions.

1.2. Temporal need-threat model of ostracism

Specific reactions to experiences of ostracism are described and explained in a temporal need-threat model of ostracism (Williams, 2009). This model describes the effect of ostracism in three phases: reflexive, reflective, and resignation. The first two phases are described below, the third is not included in our study, because resignation is a reaction that is associated with feelings of alienation, worthlessness, helplessness, and depression after long-term ostracism, which is impossible to study with our experimental design.

1.2.1. Reflexive phase

The reflexive phase includes the immediate reactions to experienced ostracism, which manifest in a change in mood and a threat to the four fundamental needs: belonging, self-esteem, meaningful existence, and control. From an evolutionary perspective, ostracism and social exclusion might have had a large impact on an individual's chances for survival and reproduction. This probably led to the development of an innate adaptive mechanism to detect even mild signs of ostracism and allow a person to act accordingly (Williams & Wesselmann, 2011). The detection occurs quickly, and it is basically a reflex; it is associated with the experience of social pain that is neuroanatomically similar to the experience of physical pain (Eisenberger et al., 2003). The experience of social pain caused by ostracism manifests in the lower satisfaction of the four human needs: belonging, self-esteem, meaningful existence, and control. Williams (2009) explained that the need to belong is endangered because a person is denied being part of a group or a dual relationship. A lack of awareness of the reasons for such treatment leads to reflections on why they deserved that, which is hurtful for self-esteem (even more than dealing with a specific reason). Ostracism can also lead to an existential threat in the form of the threat to meaningful existence (likened to "social death") and since one does not encounter any reaction and thus cannot solve the situation, one also loses control. The social pain caused by the ostracism is also related to a decrease in positive affect and an increase in negative affect, which includes anxiety, sadness, and anger (Eisenberger et al., 2003; Williams, 2009).

These proposed effects of ostracism have already been examined in experimental studies. However, while Wolf et al. (2015) succeeded in verifying the negative impact on all four needs using the new Ostracism Online method, the subsequent replication by Schneider et al. (2017) failed to verify the effect on a control need. Thus, in our study, we will re-examine the effect of ostracism with the same design; moreover, we will also examine the presumed effect on the decrease in positive affect.

- H1a. Ostracized people will derive lower satisfaction from belonging, self-esteem, control, and meaningful existence than non-ostracized people.
- H1b. Ostracized people will be in a worse mood than non-ostracized people.

1.2.2. Social anxiety

The original theory states that the reflexive reaction should be resistant to the effects of situational and personality factors. However, based on prior knowledge about the role of social anxiety, we intend to re-examine the possible moderating effects of this personal characteristic. In general, socially anxious people are more afraid of evaluations from others, they quickly register even the slightest signs of rejection, and they tend to interpret unclear situations rather negatively (Miller, 2009). In line with social compensation hypotheses, socially anxious people may even be more vulnerable to a negative online experience because they may have fewer opportunities to compensate for the online experiences with another interaction (Valkenburg & Peter, 2007). Prior studies showed that social anxiety is linked to additional negative online experiences. For instance, McCord et al. (2014) found a strong link between social anxiety and anxiety during interactions on Facebook. Specifically, socially anxious people were worried that they would not receive feedback for a message or a request for friendship, they had greater fear of writing posts on their own or on someone else's wall, and they fretted about commenting on the posts of others. Regarding cyberostracism, Zadro et al. (2006) found that people with higher social anxiety take longer to recover from the experience of ostracism induced by the Cyberball task. Even though the study did not show a moderating effect in the immediate reactions, we take into consideration that Ostracism Online is more personal and socially interactive than the Cyberball task, and that it could, therefore, be more threatening for socially anxious people. Based on these assumptions, we will re-examine the hypothesis that socially anxious people perceive the experience of ostracism as more threatening.

- H2. Ostracized individuals with higher social anxiety will experience lower needs satisfaction.

1.2.3. Reflective reaction

In the reflective phase, people elaborate and evaluate the episode of ostracism and subsequently apply cognitive and behavioral strategies to proceed toward recovery. According to the need-fortification

hypothesis, people choose behaviors that will strengthen their most threatened needs (Williams, 2009). The model offers two possible responses to recover from the experience of ostracism: prosocial and antisocial. Reacting in a prosocial manner should increase the chances for re-inclusion, which then results in an increase in the satisfaction of belonging and self-esteem. On the other hand, people who are more threatened with respect to the needs for control and meaningful existence should choose an antisocial response, because they tend to provoke a reaction regardless of the possible negative consequences (Williams, 2009).

Wesselmann et al. (2015) stated that ostracized people show more extreme reactions than the other people involved, regardless of whether it is prosocial or antisocial behavior. Most research focuses on each reaction separately, so it can be assumed that ostracized people will be reflected more in any available response in order to fortify at least some needs. In our study, we intend to contribute to this line of research by examining whether the above mentioned dyads of the most threatened needs predict the respective reaction.

- H3a. Ostracized people who are less satisfied in the needs of belonging or self-esteem will tend to choose a prosocial response.
- H3b. Ostracized people who are less satisfied in the needs of meaningful existence or control will tend to choose an antisocial response.

Recently, the evasive reaction was added to the model (Ren et al., 2016). In their study, introversion predicted a higher desire for solitude after experiencing ostracism. We intend to further explore this type of reaction. Though the need-fortification hypothesis does not take this reaction into account –because people with high levels of social anxiety tend to avoid social situations where there is a risk of rejection (Miller, 2009)– we assume that socially anxious people will not want to continue to interact with the group that ostracized them.

- H3c. Ostracized individuals with higher social anxiety will tend to choose an evasive response.

2. Material and methods

2.1. Participants

In November 2019, we shared an invitation for participation in this study in Czech universities' Facebook groups. An incentive was a chance to win one of five prizes of approximately 7€. Therefore, convenience sampling was used. A total of 671 people entered the study and 246 finished it. The largest attrition occurred during experimental manipulation. Fifty participants were excluded, either based on manipulation checks (adapted from Wolf et al., 2015) or reported technical difficulties. The final sample comprised of 196 participants (62% women) aged 18-30 (M=22.51, SD=2.80); 67% had secondary, 32% tertiary, and 1% primary education. Participants were randomly assigned to one of two experimental conditions. The ostracized condition included 88 participants (45% of the sample). The groups did not significantly differ in gender ($\chi^2(1)=0.912$, p=.339), age (t(194)=0.43, p=.666), nor SNS usage (t(194)=1.21, p=.229).

2.2. Procedure and instruments

Participants were told that the study examined SNS users' online behavior and that they would be asked to complete a questionnaire and contribute to a group task with other online participants. They were assured of their anonymity and their right to quit at any time. Participants provided informed consent by entering the survey. The first part of the study was comprised of questions about demographics, anxiety, positively worded self-esteem items (Rosenberg, 1965) (to alleviate the effect of anxiety items), and a question about their use of SNS. Then they engaged in a group task (section 2.2.1), after which they completed the reflexive need-satisfaction and mood questionnaire, and manipulation checks. Then, participants interacted with the group again in a cooperative financial task (section 2.2.3). To fulfill the aim of the study, the participants were misled to believe that they were interacting with real people. In reality, the other participants and their reactions were pre-programmed, and they differed according to the assigned experimental condition. The manipulation was explained after the survey.

2.2.1. Ostracism

We adapted Ostracism Online (Wolf et al., 2015) to manipulate the level of ostracism. Participants were told that they had to solve a short group task with other people online. In reality, only the participants were involved in the experiment; the other profiles and reactions were programmed. From the provided options, the participants chose their display name and a profile picture. They also wrote a short text (140-400 characters) to introduce themselves to the group. Then the participants were asked to "meet" the others in a pre-programmed virtual room, where they were to inspect the other profiles and where they could "Like" and receive "Likes" (Figure 1). Participants were instructed that this part would last three minutes, and it was important that they engaged in it. To increase credibility, an animation was used to represent the established connection. Although the experimental procedure was limited in external validity, it overcame the limitations of Cyberball by simulating a situation which can be encountered on social media. Concerning the internal validity, the pre-programmed manipulation and random assignment of experimental conditions could ensure higher internal validity, though online administration limited the overall control of the procedure.

Figure 1. Example profile

In their original study, Wolf et al. (2015) created 11 pre-programmed profiles and tried to achieve the maximum diversity in terms of age, gender, and race by asking people from different backgrounds to write an introductory paragraph about themselves. In this study, we followed a similar procedure, though only people from the considered population –the users of SNS, aged 18 to 30 (n=10)– were addressed. They were mostly university students. The descriptions were then revised and piloted in the cognitive interviews (n=5).

In the experiment, a total of nine profiles (including the participant's) were displayed, with the participant's profile in the upper left corner. In both conditions, the pre-programmed members received the same amount of "Likes" (ranging from two to seven). In the experimental condition, the participants received only one "Like" on their profile (i.e., the least amount of "Likes" in a group) and, in the control condition, participants received four "Likes" (i.e., the average amount).

2.2.2. Reflexive reactions

Belongingness, self-esteem, meaningful existence, and control were measured with the Reflexive Need-Satisfaction Questionnaire (Williams, 2009). The tool assesses four dimensions of the feelings experienced during the manipulation with 20 items and a five-point Likert scale (1=Strongly disagree, 5=Strongly agree). CFA in R (*lavaan* package), using UWLS, confirmed the four-dimensional structure. The 19-item model (one item –"I felt I was unable to influence the action of others"– was deleted due to low discrimination) had a satisfactory fit (TLI=.972, CFI=.976, SRMR=.080, RMSEA=.056). The subscales' scores were computed by averaging the answers. Belongingness was measured with five items (e.g., "I felt I belonged to the group"), M=3.3, SD=0.95, α=.842. Self-esteem was measured with five

items (e.g., "I felt liked"), M=3.0, SD=0.83, α=.792. Meaningful existence was measured with 5 items (e.g., "I felt invisible (R)"), M=3.3, SD=0.89, α=.812. Control was measured with four items (e.g., "I felt powerful"), M=2.5, SD=0.85, α=.724.

Mood was measured with four items ("I feel good/friendly/angry/sad") on a five-point Likert scale (1=Strongly disagree, 5=Strongly agree) adapted from Williams' (2009). The items "angry" and "sad" were reversed, and the final score was computed as an average (M=3.94, SD=0.88, α=.827).

2.2.3. Reflective reactions

The second group task was in the form of a cooperative financial game measuring reflective reactions (e.g., prosocial, antisocial, evasive). The task was to collectively manage money in order to maximize the group's overall profit. Participants were told that everyone was randomly assigned a game credit of a different amount. The minimum amount (500CZK – approximately 19€) was required to play the game. The participant received credit of 800CZK. Seven of the pre-programmed players received a sufficient amount of game money (e.g., 500CZK to 1,000CZK). One received only 200CZK; this player then asked the participant for a 300CZK loan, which would allow both to play the game. Refusing the loan meant the other player would not be able to play the game, which strengthened the participant's position in the game.

The participant could respond in three ways. Their response was coded as prosocial when they provided the money (82%), antisocial when they refused the request (16%), and evasive if they chose not to play the game (1.7%). Due to the low prevalence, the evasive response was not included in the analysis and H3c could not be tested. After participants responded to the request, the manipulation was ended, followed by debriefing.

2.2.4. Internalization of manipulation

To verify the effect of ostracization, we included four control items about the internalization of manipulation (Wolf et al., 2015). The first question was: "If we consider that there was an average number of 'Likes' in the group (for example, around four), how would you consider the number of 'Likes' you received?" Participants answered Below average, Around average, or Above average. They generally answered accordingly, 94% of the ostracized group chose the option "below average" and 94% of the non-ostracized group chose either "around average" or "above average".

Three other items asked if participants felt ignored, excluded, and if others liked their contribution (1=Definitely not, 5=Definitely yes).

2.2.5. Social anxiety

Social anxiety was measured with the 10-item Short Form of Social Interaction Anxiety Scale (Kupper & Denollet, 2012) (e.g., "I am nervous mixing with people I don't know well") with answers on a four-point Likert scales (1=Strongly disagree, 4=Strongly agree). The final score was computed by summing the items (M=23.06, SD=7.38, α=.915).

3. Results

The following analyses were conducted with IBM SPSS Statistics 26. First, we checked the manipulation. The average score across the items measuring internalization of manipulation was used to test the difference between groups. As expected, participants in the experimental condition felt more ignored and excluded (M=3.36, SD=0.87) than the control group (M=1.93, SD=0.64), t(153.65)=-12.71, p<.001, d=1.87.

3.1. Reflexive reactions

To test the hypotheses that ostracized people are more negatively affected in their reflexive reactions (H1a and H1b), we performed a series of independent t-tests. We applied Bonferroni correction to reduce the risk of a Type 1 error in multiple testing; the required p-value to reject the null hypothesis was p<.01. As expected, the satisfaction of all four needs (belongingness, self-esteem, meaningful existence, and control) and mood were lower in the experimental (ostracized) group than in the control group (Table

1). The effect sizes ranged between 0.5-0.9, showing moderate to large effects. H1a and H1b were thus supported.

Table 1. Independent t-tests of needs satisfaction and mood								
	Inclusion (n=108)		Ostracism (n=88)		t	df	p	d
	M	SD	M	SD				
Belongingness	3.64	0.83	2.87	0.91	6.18	194	<.001	0.88
Self-esteem	3.21	0.79	2.75	0.81	4.06	193	<.001	0.58
Meaningful existence*	3.63	0.72	2.90	0.91	6.20	164.16	<.001	0.90
Control	2.70	0.87	2.24	0.75	3.89	194	<.001	0.56
Mood	4.13	0.86	3.70	0.85	3.44	194	.001	0.50

Note. *Welch's test for unequal variances was used.

3.2. Moderation of reflexive reactions

To test whether social anxiety moderates the relationship between ostracism and reflexive responses (H2), we conducted four hierarchical multiple linear regressions to predict the satisfaction of needs (belongingness, self-esteem, meaningful existence, and control). Control variables (age, gender) were entered in the first step, followed by the experimental condition (second step), social anxiety (third step), and the interaction of the condition and social anxiety (fourth step).

The general pattern of results in the first three steps was similar. Ostracism and social anxiety predicted all four needs negatively. A weak gender effect showed higher self-esteem satisfaction among men. Adding the interaction term did not significantly improve any model (all $\Delta R^2 \leq .06$) and the interactions were not significant; hence, H2 was not supported. To interpret the main effects, we present the results of step 3 (i.e., without the interaction; Table 2).

Table 2. Standardized regression coefficients predicting satisfaction of needs (step 3)							
	Belongingness		Self-esteem		Meaningful existence		Control
	β	p	β	p	β	p	β	p
Gender	-.016	.810	.124	.042	.100	.105	.081	.230
Age	-.026	.700	.093	.127	.054	.383	.057	.406
Ostracism	-.415	<.001	-.293	<.001	-.421	<.001	-.273	<.001
Social anxiety	-.159	.017	-.446	<.001	-.321	<.001	-.241	<.001
R^2	.189		.315		.293		.145	
ΔR^2 from step 2	.025		.194		.101		.057	
F	11.15***		21.88***		19.83***		8.08***	

Note. ***p<.001.

3.3. Reflective reactions

To test the hypotheses related to the reflective reactions (H3a, H3b), we performed a 2×2 χ^2-test of independence on an ostracized subsample. We hypothesized that the participants with the most threatened (least satisfied) inclusionary need would behave prosocially, while those with the most threatened power/provocation need would behave antisocially. We created two groups: a prosocial group comprised of the participant who scored lowest on belongingness or self-esteem; and a provocative group comprised of those who scored lowest on meaningful existence or control. There was no significant association with the reflective reaction ($\chi^2(1,81)=0.003$, p=.956, Cramer V=.006), so H3a and H3b were not supported.

These results suggest that there is no direct link between the most threatened need and reaction. To further explore the relationship, we tested whether the reaction was affected by the magnitude of each of the threatened needs. We performed four moderated logistic regressions with the total sample to predict the binary outcome (0=prosocial, 1=antisocial) according to the controls (gender, age) (first step), ostracism (second step), the separate satisfaction of needs (third step), and their interactions (fourth step). Adding the interaction term did not significantly improve any model (all $\Delta R^2 \leq .013$), and the interactions were not significant; thus, for parsimony, we present the results of step 3 (Table 3). The results indicate that the threatened needs did not sufficiently explain why people chose the antisocial response. The only significant result suggests that ostracized people chose the antisocial reaction more often than the control group. However, when testing a model with ostracism as the single predictor, we found that ostracism had

a very weak predictive ability and explained only 4.7% of the variance (Nagelkerke's R^2) of the reflective response.

Model	Predictor	b	SE	Wald(df)	p	OR	95% CI (OR)
Table 3. Logistic regressions predicting antisocial reflective reaction (step 3)							
1	Gender	0.54	0.41	1.78(1)	.182	1.72	0.77-3.84
	Age	0.1	0.07	2.05(1)	.152	1.1	0.96-1.26
	Ostracism	0.86	0.44	3.88(1)	.049	2.36	1.00-5.54
	Belongingness	-0.23	0.21	1.1(1)	.295	0.8	0.52-1.22
	(Constant)	-4.52	1.65	7.53(1)	.006	0.01	
-2LL=160.45, χ^2(4)=10.34, p=.035, Nagelkerke's R^2=.090 (ΔR^2 from step 2=.009)							
2	Gender	0.47	0.41	1.3(1)	.254	1.6	0.71-3.56
	Age	0.08	0.07	1.38(1)	.240	1.09	0.95-1.24
	Ostracism	1.11	0.43	6.81(1)	.009	3.05	1.32-7.04
	Self-esteem	0.29	0.26	1.23(1)	.267	1.34	0.8-2.23
	(Constant)	-4.21	1.64	6.54(1)	.011	0.01	
-2LL=160.07, χ^2(4)=10.34, p=.035, Nagelkerke's R^2=.090 (ΔR^2 from step 2=.010)							
3	Gender	0.51	0.41	1.58(1)	.209	1.67	0.75-3.72
	Age	0.09	0.07	1.81(1)	.178	1.1	0.96-1.26
	Ostracism	1.06	0.44	5.75(1)	.017	2.88	1.21-6.83
	Meaningful existence	0.08	0.25	0.1(1)	.748	1.08	0.67-1.76
	(Constant)	-4.46	1.65	7.34(1)	.007	0.01	
-2LL=161.44, χ^2(4)=9.35, p=.053, Nagelkerke's R^2=.082 (ΔR^2 from step 2=.001)							
4	Gender	0.48	0.41	1.39(1)	.239	1.62	0.73-3.62
	Age	0.08	0.07	1.42(1)	.233	1.09	0.95-1.24
	Ostracism	1.16	0.43	7.24(1)	.007	3.2	1.37-7.45
	Control	0.34	0.25	1.86(1)	.173	1.4	0.86-2.28
	(Constant)	-4.27	1.63	6.84(1)	.009	0.01	
-2LL=159.67, χ^2(4)=11.12, p=.025, Nagelkerke's R^2=.097 (ΔR^2 from step 2=.016)							

We also further explored the role of social anxiety as a possible moderator for the relationship between ostracism and antisocial response. We conducted an additional analysis to predict reaction (0=prosocial, 1=antisocial) according to controls (gender, age) (first step), ostracism (second step), social anxiety (third step), and their interaction (fourth step). The final model, including the interaction term, was not significant, -2LL=160.14, χ^2(5)=10.65, p=.059 ($\Delta R2 = .006$), and neither was the interaction, nor the main effect of the social anxiety. The only significant predictor was, again, ostracism.

4. Discussion and conclusion

The aim of this study was to examine how young people react to the experience of ostracism on social networking sites (SNS) with the experimental method Ostracism Online. Based on the theory of the temporal need-threat model of ostracism (Williams, 2009), we examined user reactions both immediately after the experience of ostracism (i.e., the reflexive phase) and as part of a delayed reaction, when users have had the opportunity to process the situation and give it some meaning (i.e., the reflective phase).

The results show that the experience of ostracism led to a threat to all four needs, and mood. A strong effect was found for the needs related to belonging and meaningful existence, and a moderate effect was found for self-esteem, the need for control, and mood. These findings are consistent with previous research (Williams, 2009; Wolf et al., 2015). Williams (2009) states that in studies of the reflexive response to ostracism, the magnitude of the effect ranges from 1.0 to 2.0. However, that work refers to research on offline ostracism. A meta-analysis of 120 studies that used Cyberball manipulation (Hartgerink et al., 2015) showed an average magnitude of the effect as d>|1.4|. In our study, the magnitude of the baseline effect was d=0.96 and even a bit smaller for the subscales. It is possible that ostracism in the form of insufficient feedback within an ad hoc-created group on a SNS is slightly less threatening than exclusion in an offline environment. Nevertheless, the effect is still rather strong, and a valid question is whether more real-life conditions, such as students getting together to participate in a group project, would yield an even stronger negative effect.

In the second analysis, we investigated whether the reflexive reaction is moderated by social anxiety. Although a higher level of social anxiety was related to the lower satisfaction of needs, there was no moderation effect on ostracism; thus, our hypothesis was not supported. These results are consistent with

the findings of previous research on the reflexive response to ostracism (Schneider et al., 2017; Zadro et al., 2006). This suggests that social anxiety is not a factor which would support the stronger feelings of threat to fundamental needs due to ostracism, even though socially anxious people may be more vulnerable to negative experiences in online communication (McCord et al., 2014). However, it should be noted that participants obtained "Likes" from strangers. Some research suggests that the total number of "Likes" is not as important as who provides the response (Hayes et al., 2018; Scissors et al., 2016). Thus, we suggest that the ostracism of strangers may not be especially threatening to people with social anxiety; nevertheless, further research could focus on whether the reflexive phase is resistant to the moderation of social anxiety if ostracism comes from a friend or a family member.

In the reflective phase, most people chose a prosocial reaction. The rest chose an antisocial reaction and almost no one chose an evasive reaction. These results are consistent with the hypothesis that, if people have the option of re-inclusion, they prefer a prosocial response (Twenge, 2005; Williams & Wesselmann, 2011). However, preference for this response may also be affected by social desirability (van-de-Mortel, 2008). Due to the low proportion of avoidance response, we were limited to a focus on prosocial and antisocial reactions.

We tested whether people who reported the highest threats in the needs to belong and self-esteem would react prosocially, while those most threatened in the needs of meaningful existence and control would react antisocially, as postulated by the need-fortification hypothesis. Our results contradict this hypothesis: there was no association between the most threatened need and the behavioral response. In the follow-up analysis, we further explored if individual needs predicted the antisocial response, but no effect was found. The antisocial response was linked only to the experience of ostracism, so that ostracized people chose the antisocial response more often than the control group. Our interpretation is that the hypothesis that linked the reaction only with specific needs threatened in the reflexive phase may be too simplistic to explain the motives for a particular action. Thus, we believe that in order to explain the preference for an antisocial response, it would be better to focus on the individual differences or situational factors rather than only on the level of the satisfaction of needs during manipulation. We attempted to further explain these reactions by examining the effect of social anxiety; however, no direct or moderating effect was found. Nevertheless, there may be other important moderators to the relationship between ostracism and antisocial response (Ren et al., 2018), such as narcissism (Chester & DeWall, 2016; Twenge & Campbell, 2003), rejection sensitivity (Ayduk et al., 2008), and an additional threat to control.

4.1. Limitations and future research
Our findings should be interpreted with several limitations in mind. First, though Ostracism Online more adequately represents real-life conditions than Cyberball, the experimental design still suffers from lower ecological validity, which was briefly discussed above. Thus, future research could try to implement procedures that would allow for the examination of the effects of "Likes" from partners from existing social circles (such as classmates). Furthermore, due to the unequal representation of reflective responses, the sample size requirement for moderated logistic regressions increased significantly (Peduzzi et al., 1996), which could have affected the statistical power. Also, the created method (i.e., the cooperative financial task) had some drawbacks and, as a result, we could not include an evasive reaction due to low prevalence. It is possible that the low proportion of this reaction was influenced by its formulation. For future research, we recommend eliminating or changing the evasive response.

4.2. Conclusions
In conclusion, our study shows that even very subtle signs of ostracism upon ad hoc groups on SNS can lead to the lower satisfaction of the needs to belong, self-esteem, meaningful existence, control, and to worsened mood. In addition, the effect of ostracism on needs satisfaction is resistant to the moderation of social anxiety. In the reflective phase, most people choose a prosocial reaction; the rest choose an antisocial reaction; and almost no one chooses the evasive reaction. People in an ostracized condition choose an antisocial response more often than people in a control condition. No other predictors for the antisocial

response were found in this study. Ostracism was manipulated by the small number of reactions to the shared contribution, while these reactions were provided by strangers. Although it is a very subtle and an often-unintentional form of ostracism, the results of this study suggest that, even with this experience, people are partially endangered regarding their psychological well-being. Based on these findings, we can better understand the importance of paralinguistic digital affordances (PDA) in online social interaction and their role in inducing a sense of belonging. We should keep these conclusions in mind, especially at the present time, when a substantial amount of social interactions (including education and work) occur online. Specifically, those who are responsible for guiding and moderating these interactions, such as the teachers of online lessons, should be aware of the possible negative consequences of allowing/using PDA and help students to understand and cope with negative cyberostracism experiences. Unfortunately, ostracism is an experience that is difficult to influence; a better understanding of this phenomenon could help to develop effective coping strategies.

Funding Agency

References

Ayduk, Ö., Gyurak, A., & Luerssen, A. (2008). Individual differences in the rejection–aggression link in the hot sauce paradigm: The case of rejection sensitivity. *Journal of Experimental Social Psychology*, *44*(3), 775-782. https://doi.org/10.1016/j.jesp.2007.07.004

Burrow, A., & Rainone, N. (2017). How many likes did I get? Purpose moderates links between positive social media feedback and self-esteem. *Journal of Experimental Social Psychology*, *69*, 232-236. https://doi.org/10.1016/j.jesp.2016.09.005

Chester, D., & DeWall, C. (2016). Sound the alarm: The effect of narcissism on retaliatory aggression is moderated by dACC reactivity to rejection. *Journal of Personality*, *84*(3), 361-368. https://doi.org/10.1111/jopy.12164

Donate, A., Marques, L., Lapenta, O., Asthana, M., Amodio, D., & Boggio, P. (2017). Ostracism via virtual chat room—Effects on basic needs, anger and pain. *PLoS ONE*, *12*(9), e0184215. https://doi.org/10.1371/journal.pone.0184215

Eisenberger, N., Lieberman, M., & Williams, K. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, *302*(5643), 290-292. https://doi.org/10.1126/science.1089134

Hartgerink, C., van Beest I., J.M., W., & K.D., W. (2015). The Ordinal Effects of Ostracism: A Meta-Analysis of 120 Cyberball Studies. *PLoS ONE*, *10*(5), e0127002. https://doi.org/10.1371/journal.pone.0127002

Hayes, R., Carr, C., & Wohn, D. (2016). One click, many meanings: Interpreting paralinguistic digital affordances in social media. *Journal of Broadcasting & Electronic Media*, *60*(1), 171-187. https://doi.org/10.1080/08838151.2015.1127248

Hayes, R., Wesselmann, E., & Carr, C. (2018). When nobody "Likes" you: Perceived ostracism through paralinguistic digital affordances within social media. *Social Media + Society*, *4*(3), 1-2. https://doi.org/10.1177/2056305118800309

Kowalski, R., Giumetti, G., Schroeder, A., & Lattanner, M. (2014). Bullying in the digital age: A critical review and meta-analysis of cyberbullying research among youth. *Psychological Bulletin*, *140*(4), 1073-1137. https://doi.org/10.1037/a0035618

Kupper, N., & Denollet, J. (2012). Social anxiety in the general population: Introducing abbreviated versions of SIAS and SPS. *Journal of Affective Disorders*, *136*(1-2), 90-98. https://doi.org/10.1016/j.jad.2011.08.014

McCord, B., Rodebaugh, T., & Levinson, C. (2014). Facebook: Social uses and anxiety. *Computers in Human Behavior*, *34*, 23-27. https://doi.org/10.1016/j.chb.2014.01.020

Miller, R.S. (2009). Social anxiousness, shyness, and embarrassability. In M. R. Leary, & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 176-191). The Guilford Press. https://bit.ly/3myP2k4

Peduzzi, P., Concato, J., Kemper, E., Holford, T., & Feinstein, A. (1996). A simulation study of the number of events per variable in logistic regression analysis. *Journal of Clinical Epidemiology*, *49*(12), 1373-1379. https://doi.org/10.1016/s0895-4356(96)00236-3

Reich, S., Schneider, F., & Heling, L. (2018). Zero Likes - Symbolic interactions and need satisfaction online. *Computers in Human Behavior*, *80*, 97-102. https://doi.org/10.1016/j.chb.2017.10.043

Ren, D., Wesselmann, E., & Williams, K. (2018). Hurt people hurt people: Ostracism and aggression. *Current Opinion in Psychology*, *19*, 34-38. https://doi.org/10.1016/j.copsyc.2017.03.026

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press. https://doi.org/10.1515/9781400876136

Ryan, T., Allen, K., Gray, D., & McInerney, D. (2017). How social are social media? A review of online social behaviour and connectedness. *Journal of Relationships Research*, *8*. https://doi.org/10.1017/jrr.2017.13

Schneider, F., Zwillich, B., Bindl, M., Hopp, F., Reich, S., & Vorderer, P. (2017). Social media ostracism: The effects of being excluded online. *Computers in Human Behavior*, *73*, 385-393. https://doi.org/10.1016/j.chb.2017.03.052

Scissors, L., Burke, M., & Wengrovitz, S. (2016). What's in a Like? Attitudes and behaviors around receiving Likes on Facebook. In *CSCW '16: Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (pp. 1501-1510). ACM. https://doi.org/10.1145/2818048.2820066

Tobin, S., McDermott, S., & French, L. (2018). The role of group size in reactions to ostracism and inclusion. *Group Processes & Intergroup Relations*, *21*(7), 1014-1033. https://doi.org/10.1177/1368430217702723

Tobin, S., Vanman, E., Verreynne, M., & Saeri, A. (2015). Threats to belonging on Facebook: Lurking and ostracism. *Social Influence*, *10*, 31-42. https://doi.org/10.1080/15534510.2014.893924

Twenge, J. (2005). When does social rejection lead to aggression? The influences of situations, narcissism, emotion, and replenishing connections. In K. Williams, J. Forgas, & W. von Hippel (Eds.), *The social outcast: Ostracism, social exclusion, rejection, and bullying* (pp. 202-212). Psychology Press. https://doi.org/10.4324/9780203942888

Twenge, J., & Campbell, W. (2003). Isn't it fun to get the respect that we're going to deserve? Narcissism, social rejection, and aggression. *Personality and Social Psychology Bulletin*, *29*(2), 261-272. https://doi.org/10.1177/0146167202239051

Valkenburg, P., & Peter, J. (2007). Preadolescents' and adolescents' online communication and their closeness to friends. *Developmental Psychology*, *43*(2), 267-277. https://doi.org/10.1037/0012-1649.43.2.267

van-de Mortel, T. (2008). Faking it: Social desirability response bias in self-report research. *Australian Journal of Advanced Nursing*, *25*(4), 40-48. https://bit.ly/2JfgZyP

Wesselmann, E., Ren, D., & Williams, K. (2015). Motivations for responses to ostracism. *Frontiers in Psychology*, *6*, 40-40. https://doi.org/10.3389/fpsyg.2015.00040

Williams, K. (2009). Ostracism: A temporal need-threat model. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 406-407). Elsevier Academic Press. https://doi.org/10.1016/S0065-2601(08)00406-1

Williams, K., Cheung, C., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, *79*(5), 748-762. https://doi.org/10.1037/0022-3514.79.5.748

Williams, K., & Wesselmann, E. (2011). The link between ostracism and aggression. In *The psychology of social conflict and aggression* (pp. 37-51). Psychology Press. https://doi.org/10.4324/9780203803813

Wohn, D.Y., Carr, C.T., & Hayes, R.A. (2016). How affective is a "Like"? The effect of paralinguistic digital affordances on perceived social support. *Cyberpsychology, Behavior, and Social Networking*, *19*(9), 562-566. https://doi.org/10.1089/cyber.2016.0162

Wolf, W., Levordashka, A., Ruff, J., Kraaijeveld, S., Lueckmann, J., & Williams, K. (2015). Ostracism online: A social media ostracism paradigm. *Behavior Research Methods*, *47*(2), 361-373. https://doi.org/10.3758/s13428-014-0475-x

Zadro, L., Boland, C., & Richardson, R. (2006). How long does it last? The persistence of the effects of ostracism in the socially anxious. *Journal of Experimental Social Psychology*, *42*(5), 692-697. https://doi.org/10.1016/j.jesp.2005.10.007