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Cyberstalking scale: development and relations with gender, FOMO and social media engagement

Isabella Leandra Silva Santos[1] · Carlos Eduardo Pimentel[1] · Tailson Evangelista Mariano[1]

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Abstract

Cyberstalking is a form of persecution that has proliferated with technology's evolution. The present research aimed to develop a cyberstalking measure and observe its relations with Fear of Missing Out (FOMO), social media engagement, and sociodemographic variables. To achieve these goals, two studies were performed. In the first study, 200 subjects (76.5% female, with a mean age of 21.6 years) answered the 15 items originally developed for the scale. These data went trough exploratory factor analysis and Cronbach's alpha to verify the reliability of the instrument. The results indicated the exclusion of five items, and after this removal, the scale was valid and reliable ($\alpha = 0.86$). In the second study, which also had 200 subjects (65% female and an average age of 21.8 years), was realized confirmatory factor analysis (measuring the model fit), accompanied by correlations and mediation analysis. The analyzes demonstrated that the one-factor model was adequate (GFI = 0.98; CFI = 0.99; TLI = 0.99; RMSEA = 0.02; SRMR = 0.06). Path analysis showed social media engagement as a significant mediator of FOMO and gender's impact on cyberstalking: Both had direct (FOMO: $\lambda = 0.31$; CI = 0.19–0.42; $p < 0.01$; Gender: $\lambda = 0.12$; CI = 0.02–0.22; $p < 0.05$) and indirect effects (FOMO: $\lambda = 0.07$; CI = 0.03–0.11; $p < 0.01$; Gender: $\lambda = 0.04$; CI = 0.01–0.07; $p < 0.01$).

Keywords Cyberstalking · Fear of missing out · Social media engagement · Gender

Introduction

"Privacy is dead and social media hold the smoking gun", said Peter Cashmore, founder of Mashable, in a special for CNN in 2009. Twelve years later, this phrase couldn't be closer to reality: If on the one hand, keeping track of personal information online has become an increasingly complex task, on the other hand, this concern does not seem to affect the numbers of social media users: Instagram, for example, reached one billion active users in June 2018 (Choi et al., 2018; Statista, 2019). These two characteristics of the virtual environment (lack of controllability and exponential growth) do not exist without impacting the users' lives.

One of the negative impacts is cyberstalking, defined as a form of harassment (frequently observing, keeping in touch insistently) that uses electronic tools and the virtual environment to control, manipulate and coerce the victim (Sheridan & Lyndon, 2012; Smoker & March, 2017). Sheridan and Grant (2007) offer a list of the main components of cyberstalking: using social networks and other virtual environments to gather information about the victim, sending unsolicited messages frequently, electronic sabotage (sending viruses or hacking accounts), pretending to be someone else, posting false information, and get other users to contribute to your persecution, even if indirectly.

However, it is relevant to note that these essential cyberstalking elements are always transmuting to parallel the accelerated technological developments and the new functions inserted and popularized in the virtual environment. This issue is clear when comparing research conducted within a time interval: Although both studies talk about the use of technology to control/pursue a loving partner, the research conducted by Burke et al. (2011) focused on functions such as text messaging, email and Facebook use, while Smoker and March (2017), already address issues such as tracking apps, information screenshots, and Instagram.

Similar to traditional persecution, cyberstalking can be performed both by a stranger and someone who has or had contact with the victim before (Horsman & Conniss, 2015). However, the virtual version of the stalking seems to become common among acquaintances, especially between romantic partners. Burke et al. (2011) observed that half of their sample

✉ Isabella Leandra Silva Santos
isalss2010@gmail.com

[1] Departament of Psychology, Federal University of Paraíba, João Pessoa, Paraíba, Brazil

reported previous engagement in a situation where technology was used by a loving partner to monitor actions, either as the victim or the initiator of the behavior. But why such a high prevalence?

One possibility is that behaviors usually considered inappropriate or intrusive (e.g. monitoring the places that a person frequents) in the offline world, are normalized in the virtual environment as a proper form of interpersonal interaction, especially in seeking/maintaining romantic involvement (Spitzberg & Cupach, 2007). Using the previous example, knowing that someone frequents certain places thanks to their posts on social media is common and even facilitated by functions such as tagging your location. Thus, in a society where more and more personal information is exposed, discussed, criticized, and used, the line between what is socially acceptable becomes more and more blurred.

Another related alternative is the fact that actions perpetuated on the internet are often not seen as having the same severity as something that occurs in face-to-face interactions, even when they cause similar consequences: An example is that many people still evaluate cyberbullying as less serious than bullying because there is no physical aggression, even when cyberbullying is related to issues such as ideation and suicidal behavior in the victims (Barlett, 2019; Brailovskaia et al., 2018; Nikolaou, 2017). Likewise, even occurring exclusively in the virtual environment, cyberstalking can lead to psychological (e.g. depressive symptoms, sleep disorders), financial, and social consequences for the victims (Smoker & March, 2017).

Measuring Cyberstalking

The psychological literature has some measures regarding cyberstalking. In a study on problematic use of social media, Kircaburun et al. (2018) developed eight items based on three subdivisions of cyberstalking: persecution of current partner, persecution of past or desired partner, and harassment of despised ones. However, this instrument was only used in a dichotomous manner in the study.

Smoker and March (2017) proposed a 21-item instrument based on studies and legislation on traditional stalking. A limitation of this scale, despite indicating internal consistency, is to be limited to measuring behaviors related exclusively to a current romantic partner. These authors also highlight the scarcity of specific instruments to measure cyberstalking in the literature (Smoker & March, 2017).

Given these limitations, one of the aims of the present study was to develop a brief instrument to measure cyberstalking. This scale considered not only romantic relationships (past, current, and desired), but also included persecution of acquaintances and people that the perpetrator suspects/dislikes.

Sociodemographic Variables and Cyberstalking

In addition to an appropriate form of measurement, it is essential to understand which variables are related to cyberstalking. First, sociodemographic variables such as gender, age, and relationship status can provide some interesting information. Although traditional stalking is mostly represented by male perpetrators, cyberstalking is more common among women (Smoker & March, 2017; March et al., 2020). One explanation for this is that women are more likely to engage in covert stalking behaviors, such as cyberstalking (Purcell et al., 2010).

Whether or not a person is in a relationship can also predict cyberstalking. Cyberstalking a partner is the most common form of this behavior since the perpetrator has more resources and freedom to keep the victim under control (Smoker & March, 2017; Spitzberg & Cupach, 2007). Finally, the subjects' age will also be taken into account. Despite the existing data being focused on victimization, cyberstalking seems more common among young adults (Brady et al., 2017).

Fear of Missing out and Cyberstalking

An underexplored area is relating cyberstalking to other issues in the virtual world that affect mental health. One of these problems is the Fear of Missing Out (FOMO). FOMO is defined as an anxious reaction to the belief of missing out on rewarding experiences involving their social peers, which leads to a desire to be always connected, commonly through social media, with what others are doing (Franchina et al., 2018; Przybylski et al., 2013). FOMO can cause several negative outcomes, such as social media negative impact on daily-life and productivity (Rozgonjuk et al., 2020).

Although there are still no empirical results to confirm this theory, Alutaybi et al. (2020) point out that certain FOMO motivations (e.g. wanting popularity or possessing information) can lead to unhealthy behaviors, such as cyberstalking. Thus, it is plausible to hypothesize that one of the factors that can lead someone to become involved in cyberstalking is the fear of being excluded from important moments in the lives of the people they are interested in. Therefore, FOMO can increase the likelihood of cyberstalking, being one of its predictors.

Social Media Engagement and Cyberstalking

If sociodemographic variables and FOMO can be predictors of cyberstalking, what can mediate this relationship? One possibility is social media engagement, defined as the frequent use of these means of communication, even during actions that require concentration, such as professional activities and

study (Mariano et al., 2019). Previous studies indicate that this variable is related to both FOMO and gender: women and people with higher scores in FOMO also are more engaged in social media (Mariano et al., 2019; Przybylski et al., 2013).

Social media engagement also demonstrates evidence of a relationship with cyberstalking: Research shows that more time spent on social media increases the likelihood of engaging in cyberstalking (Kaur et al., 2020; Strawhun et al., 2013). Corroborating this statement, the study by Kircaburun et al. (2018) observed a positive correlation of 0.42 between this behavior and problematic use of social media. Therefore, it is plausible to hypothesize that social media engagement can mediate the relationships between the variables previously discussed.

The Present Research

Two issues are quite clear with this discussion: First, cyberstalking is a problem of the technological age, especially since unlike traditional persecution it can be carried out in a subtle and apparently socially acceptable way. Second, research on the psychological processes involved in cyberstalking is scarce, and it is necessary to deepen this knowledge. Based on these justifications, the present research aimed to:

1) Develop and validate the Cyberstalking Scale;
2) Observe their relationship with the Fear of Missing Out, social media engagement, and sociodemographic variables.

Study 1

Method

Sample Two-hundred volunteers participated in the study, who were on average 21.6 years old (SD = 6.05), and mostly female (76.5%), single (53%) and in the middle class (45.5%). Considering only the part of the sample that reported being in a relationship (41%), the average duration of this involvement was 30.9 months. It was a non-probabilistic sample of social media users.

Instruments To access the necessary information, the following measures were used:

Cyberstalking Scale (CS): Instrument composed of 15 statements and answered on a likert-type scale (with 5 points, going from totally disagree to totally agree). Its items address behaviors that are performed by the respondent (e.g. "I've used fake accounts on the internet to interact with someone without revealing my identity") and their favorability to these actions (e.g. "When you're interested in someone, it's not wrong to look at their acquaintances' social media, in order to get to know them better"). Participants were instructed to read the sentences carefully and respond according to the extent they agreed with them.

Socio-Demographic Questions: After the instrument, participants answered questions about their characteristics (age, gender, profession and social class), relationship status and length of said relationship (if applicable).

Procedures After submission and approval by the designated Ethics Committee, the first step of the study was the development of the CS. The items that make up the scale were developed based on the existing literature on the topic, especially the subcategories of cyberstalking brought by Kircaburun et al. (2018) and previously presented in this discussion. The instrument development's recommendations brought by Carretero-Dios and Pérez (2007) were also applied: The concept of cyberstalking was previously delimited, being the guide for the scale's construction. In addition to the previously mentioned subcategories, previous cyberstalking and traditional stalking instruments (e.g. Smoker & March, 2017) served as a guide in the construction and selection of items for the final scale. Two psychologists with experience in the area of online antisocial behavior adjusted the original items, selecting those who better fitted the construct. Additionally, five volunteers from the general population were asked to review the instrument and report any problems related to item comprehension; These individuals did not point out any difficulties in this process.

After this initial phase, the applications themselves were carried out in two ways: virtual (through a Google Forms questionnaire shared on Facebook, Whatsapp and Instagram) and in person (in collective environments such as university classrooms, where a properly trained researcher requested participation through booklets containing the questions). It's relevant to point out that said data collection occurred before the COVID-19 outbreak.

Finally, it should be noted that all procedures followed national standards regarding research with human beings (Brazilian Resolution 510/16), and that research participation only took place after signing the Consent Form containing relevant information about the study's main goals and details.

Data Analysis R Studio 3.6.1, specifically the psych package (Revelle, 2021), was used to analyze the responses obtained. Were performed: descriptive analyzes (to characterize the sample); principal axis factoring (in order to understand the instrument's factorial organization) in conjunction with Horn's parallel analysis; Full Information Factor Analysis (to understand which items actually contributed to construct explanation); and Cronbach's alpha (to determine the reliability of the measure).

Results

The analyzes were initiated by KMO and Bartlett's sphericity test. Their results (respectively 0.88 and $x^2 = 1029.08$, $p < 0.001$) indicated the adequacy of the sample for carrying out exploratory factor analysis. In this step, the eigenvalues criteria (factors with an eigenvalue greater than 1 are maintained) indicated the existence of 2 factors, which together explained 39.76% of the total variance. However, Horn's parallel analysis pointed out that only the first should be maintained, according to the comparison with random eigenvalues. Thus, the CS demonstrated a single-factor organization capable of explaining 32.93% of the variance (Table 1).

The items were then analyzed. To achieve this objective, the item's factor loads (values above 0.30) and their performance in Full Information Factor Analysis were observed. Figures 1 and 2 show the results of these analyzes, pointing out that in total, five items should be excluded from the final scale for not meeting the criteria.

Finally, to observe the reliability of the final scale, Cronbach's alpha was used, which obtained a value of 0.86. Also considering the excluded items, the alpha remained the same, offering more evidence for their exclusion (statistical parsimony). Thus, the final version of the Cyberstalking Scale was composed of 10 items organized in a single factor (Table 2).

Partial Discussion

The Cyberstalking Scale indices proved to be adequate according to the literature, thus demonstrating the instrument's validity and reliability (Filho & Júnior, 2010; Hair et al., 1987; Maroco & Garcia-Marques, 2006). Five items were excluded from the original version, and some possibilities can be pointed for their inadequacy: Items 5, 8, and 10 referred to the use of information available on the Internet in a broader way, not necessarily for persecution, which may have distanced them from cyberstalking. Item 15, which deals with the use of fake accounts online, may have suffered from a similar issue (anonymity has numerous purposes in the virtual environment). Finally, item 9 (which focused on seeking information from a partner's family and friends) may indicate that the main focus of a virtual stalker is the victim, with other individuals staying in the background (Sheridan & Grant, 2007).

Despite these removals, the remaining items proved to be statistically significant, leaving the need for a confirmatory analysis to observe the adequacy of this cyberstalking measurement model, as well as the constructs with which it relates. To achieve this goal, a second study was carried out.

Table 1 Parallel Analysis

	Factorial	Analysis	Parallel	Analysis
Components	Eigenvalue	Variance %	Components	Eigenvalue
1	4.94	32.93	1	1.62
2	1.02	6.83	2	1.45

Study 2

Method

Sample The second study had 200 participants, who were on average 21.8 years old (SD = 5.69). Most of these volunteers were female (65%), single (55.5%) and middle class (50.5%). The portion of the sample that reported being in a relationship (40%) was in it for an average of 43.2 months.

Instruments In addition to the adapted version of the CS and a sociodemographic questionnaire similar to Study 1, the following instruments were used:

Fear of Missing Out Scale: Single-factor measure consisting of 10 likert-like items that measures FOMO. It was developed by Przybylski et al. (2013). The scale reliability index in this study was $\alpha = 0.81$.

Social Media Engagement Questionnaire: Set of questions created by Przybylski et al. (2013) to understand social media use's habits (e.g. during a meal, after waking up). It was validated for the Brazilian context by Mariano et al. (2019), and its alpha value in the present study was 0.80.

Procedures Data collection was carried out in person and virtually (similarly to Study 1). The ethical recommendations necessary for studies with human beings were followed.

Data Analysis Through R Studio, specifically the laavan package (Rosseel, 2012), analyzes were carried out with three main objectives. First, for confirmatory factor analysis, the WLSM estimator was used considering the following adjustment indices: the Goodness-of Fit Index (GFI), the Comparative Fit-Index (CFI) and the Tucker Lewis Index (TLI) (with >0.90 being the cutoff point for good indicators); the Root-Mean-Square Error of Approximation (RMSEA) (values up to 0.08 are acceptable); and the Standardized Root Mean Square Residual (SRMR) (where >0.10 is the cutoff value) (Byrne, 2012; Hu & Bentler, 1999; Kline, 2016; Marôco, 2010). In addition to confirmatory analysis, the bivariate correlation was used to observe the relationships between cyberstalking, FOMO, social media engagement, and gender. Finally, a path analysis using the GLS estimator was performed, looking for an explanatory model.

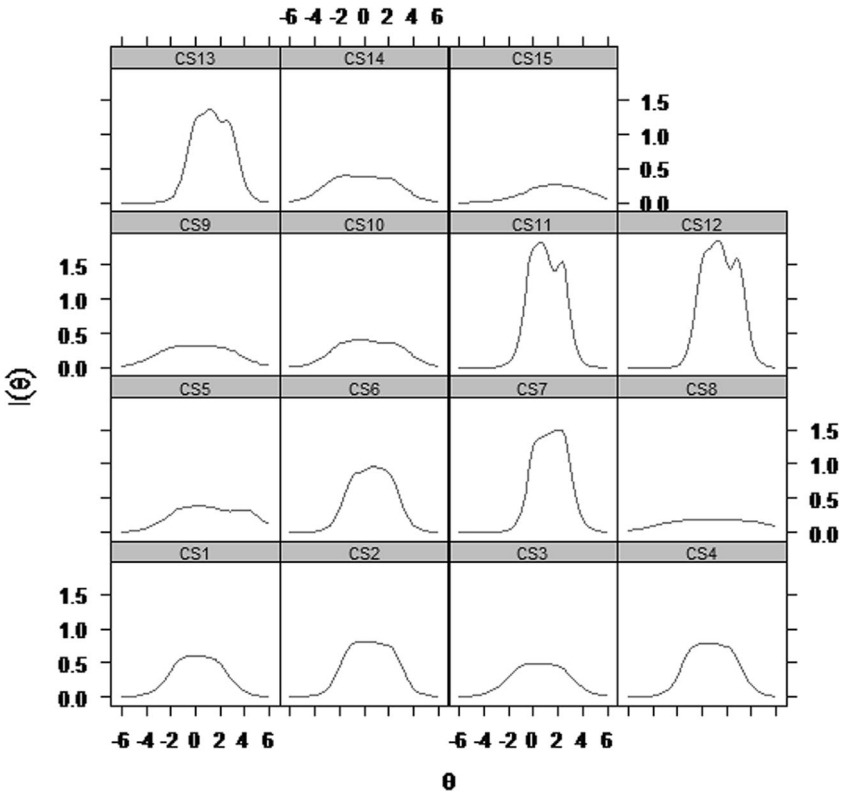

Fig. 1 Full Information Factor Analysis Results

Results

Confirmatory Factorial Analysis The model composed of the final 10 items of the CS obtained the following adequacy indices: GFI = 0.98; CFI = 0.99; TLI = 0.99; RMSEA = 0.02 (with a confidence interval between 0.01–0.05) (df = 35); SRMR = 0.06. This factorial organization can be seen in Fig. 2, and was maintained as the final version of the scale, with a reliability of $\alpha = 0.86$.

Bivariate Correlations After confirming the scale's adequacy, cyberstalking was related to FOMO, social media engagement, relationship status (the variable was transformed to 0 = single; 1 = into a relationship), gender (also coded as 0 = male; 1 = female), and participants' age. As can be seen in Table 3, cyberstalking showed a positive correlation with FOMO (r = 0.42; $p < 0.01$), social media engagement (r = 0.38; $p < 0.01$), and gender (r = 0.21; $p < 0.01$), indicating that it is more frequent between women.

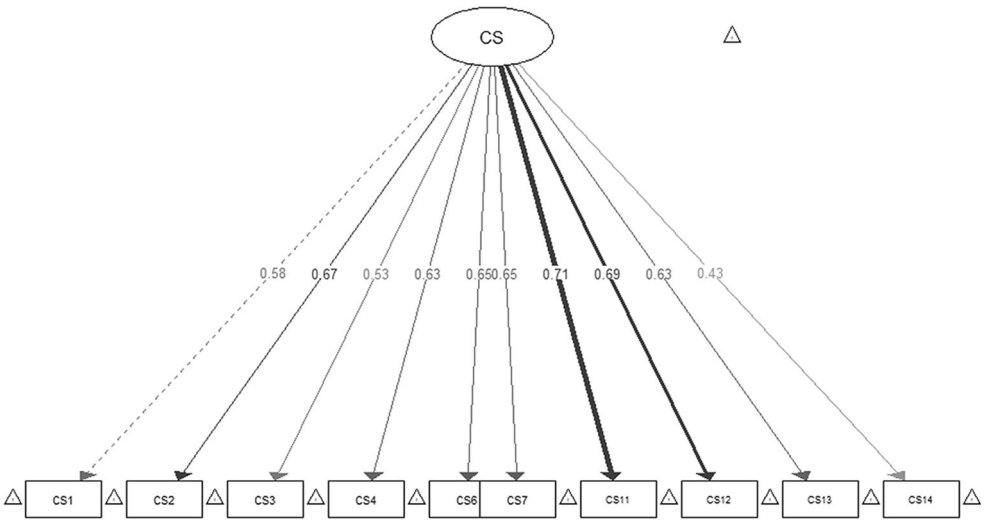

Fig. 2 Cyberstalking Scale

Table 2 Cyberstalking Scale Factorial Loads

Items (English Translation / Portuguese)	Mean (SD)	(λ)	h^2	α (if item removed)
1- I usually find the social media of someone I'm interested in, even if it takes hours / Costumo encontrar as redes sociais de alguém que tenho interesse, mesmo que demore horas.	3.16 (1.30)	0.43	0.30	0.86
2- It's ok to check who likes and comments on the posts of your partner / Acho aceitável checar quem curte e comenta as postagens de um parceiro amoroso.	2.52 (1.13)	0.66	0.50	0.85
3- I lose track of time searching for information about my acquaintances on the internet / Perco a noção do tempo buscando informações dos meus conhecidos na internet.	2.65 (1.25)	0.54	0.38	0.86
4- It is normal to "keep an eye" on the social media of someone who frequently interacts with your partner / É normal "ficar de olho" nas redes sociais de alguém que interage frequentemente com seu parceiro amoroso.	2.36 (1.12)	0.69	0.64	0.85
5- I use information disclosed on social media as an advantage to form relationships / Utilizo as informações divulgadas nas redes sociais como vantagem para formar relacionamentos.*	2.73 (1.16)	0.38	0.19	0.87
6- If a person hides their messages, I look for other ways to find out the content of them / Se uma pessoa esconde muito suas mensagens, procuro outras formas de descobrir do que elas se tratam.	2.29 (1.22)	0.65	0.45	0.85
7- If I had my partner's social media passwords, my life would be easier / Se eu tivesse as senhas das redes sociais do meu parceiro, minha vida seria mais fácil.	1.59 (0.90)	0.64	0.62	0.85
8- If information is on social media, it is not wrong to use it / Se uma informação está nas redes sociais, não é errado utilizá-la.*	2.67 (1.14)	0.27	0.14	0.87
9- When I start a relationship, I look for the social media of my partner's family and close friends / Quando começo um relacionamento, procuro as redes sociais da família e amigos próximos do meu parceiro.*	2.90 (1.33)	0.54	0.50	0.86
10- I use information on social media to check if what people say is really true / Uso as informações nas redes sociais para checar se o que as pessoas dizem é de fato verdade.*	3.01 (1.18)	0.48	0.31	0.86
11- If I could I would look at my love partner's browsing history / Se eu pudesse olharia o histórico de navegação do meu parceiro amoroso.	1.97 (1.14)	0.72	0.71	0.85
12- I prefer to form relationships with people that I can investigate on social media / Prefiro me relacionar com pessoas que eu possa investigar nas redes sociais.	1.78 (1.00)	0.69	0.53	0.85
13- I check what kind of apps my partner uses on their phone / Checo que tipo de aplicativos meu parceiro utiliza em seu celular.	1.86 (1.10)	0.65	0.52	0.85
14- When you're interested in someone, it's not wrong to look at their acquaintances' social media, in order to get to know them better / Quando se está interessado em alguém, não é errado olhar as redes sociais das pessoas próximas dele(a) para conhecê-lo(a) melhor.	3.24 (1.18)	0.56	0.43	0.85
15- I've used fake accounts on the internet to interact with someone without revealing my identity / Já utilizei contas falsas na internet para interagir com alguém sem revelar minha identidade.*	2.02 (1.45)	0.42	0.19	0.87

Notes: λ = Factorial Load h^2 = Communalities *Excluded Items

Path Analysis

Finally, a mediation model was tested as a path analysis, with FOMO and gender as predictors, social media engagement as a mediator, and cyberstalking as a dependent variable. This model had a good fit (GFI = 0.99; CFI = 0.99; TLI = 0.99; SRMR = 0.01). Considering 5000 bootstrapped samples, FOMO demonstrated direct (λ = 0.31; CI = 0.19–0.42; $p < 0.01$) and indirect (λ = 0.07; CI = 0.03–0.11; $p < 0.01$) effects. Gender also showed direct (λ = 0.12; CI = 0.02–0.22; $p < 0.05$) and indirect effects (λ = 0.04; CI = 0.01–0.07; $p < 0.01$). Thus, female subjects with high scores on FOMO are more likely to engage into cyberstalking, and this possibility increases when social media engagement is high. This model can be seen in Fig. 3.

Partial Discussion

Study 2 aimed to carry out the scale's confirmatory factor analysis and to relate it to other constructs that could be significant in understanding cyberstalking. These objectives have been met, with CS not only obtaining significant adequacy values according to the literature (Byrne, 2012; Hu & Bentler, 1999; Kline, 2016; Marôco, 2010), but demonstrating a positive correlation with FOMO, gender, and social media engagement.

Of the final items five performed better in the analysis: item 11 (If I could I would look at my love partner's browsing history), 12 (I prefer to form relationships with people that I can investigate on social media), 2 (It's ok to check who likes and comments on the posts of your partner), 6 (If a person hides their messages, I look for other ways to find out the content of them), and 7 (If I had my partner's social media passwords, my life would be easier). This indicates two interesting issues: 1) Cyberstalking does not focus exclusively on a potential love interest, but extends to other relationships; 2) Compared to the items excluded in Study 1, most of the items with the best performance deal with some issue associated with obtaining information in more specific ways to cyberstalking. These and other questions will be discussed in more detail below.

Table 3 Means, Standard Deviations, and Bivariate Correlations

	Mean	SD	1	2	3	4	5
1- Cyberstalking	2.36	0.78	–				
2- FOMO	2.63	0.73	0.42**	–			
3- Social Media Engagement	4.23	1.95	0.38**	0.32**	–		
4- Relationship Status	–	–	0.01	−0.13	−0.03	–	
5- Age	21.,8	5.69	−0.12	−0.33**	−0.29**	0.17*	–
6- Gender	–	–	0.21**	0.14*	0.19**	0.05	−0.13

Note: *p < 0,05 **p < 0,01

General Discussion

This research aimed to develop the Cyberstalking Scale and observe its relationship with FOMO, social media engagement, and sociodemographic variables. Through two studies these objectives were fulfilled, with the instrument proving to be valid and reliable and obtaining significant correlations.

Returning to the list of cyberstalking components developed by Sheridan and Grant (2007) (accumulation of information, intrusive and frequent messages, electronic sabotage, assuming a false identity, posting unreal information, and using other users as a means of increasing knowledge about the victim), the items that obtained the most significant scores fit in the search/accumulation of victim's information and in using others to achieve this goal. However, this previous study focused on cyberstalking cases involving behaviors that constitute harassment (Sheridan & Grant, 2007).

Thus, it is possible to observe that CS measures more socially acceptable cyberstalking's aspects, focusing on antisocial and non-criminal behaviors (that is, without criminal offenses and major direct consequences) (Dias et al., 2014). This statement agrees with Lowry et al. (2013), who point out that the constituent behaviors of cyberstalking aren't necessarily negative, and that the virtual stalker often does not want to harm the victim. From this, future studies must observe what damage this specific facet of virtual persecution can bring to victims by itself.

The present study also brings some indications of the profile of cyberstalkers. Corroborating the findings of Smoker and March (2017), the CS score was related to gender, with women being more likely to engage in cyberstalking. This data indicates that, although traditional stalking is usually conceived as a crime with a male stalker and a female victim (Duntley & Buss, 2012), cyberstalking is a variation that has a predominance of female perpetrators.

Besides, this result can demonstrate gender differences in the key motivations for stalking someone: Purcell et al. (2001) observed that while men did not show a specific pattern of motivations to perform this behavior, women were mostly motivated by the desire to maintain/deepen an intimate relationship with the victim. Therefore, considering that numerous CS items describe behaviors that can achieve these goals, the difference between genders in the scale score may reflect this motivational disparity.

In addition to gender differences, cyberstalking also showed a positive correlation with FOMO, being one of the main findings of the present study. Using Self-Determination Theory, FOMO is seen as a difficulty in meeting basic psychological needs, especially social closeness (development of positive relationships with other people). Thus, the findings corroborate the argument that some of the central motivations for cyberstalking are the satisfaction of the cyberstalker's needs (the desire for social bonding, for example) and, in parallel, the desire to maintain/strengthen a relationship, as previously mentioned (Lowry et al., 2013; Milyavskaya et al., 2018; Przybylski et al., 2013).

Despite the focus of previous research on participants who are/have been in a relationship, cyberstalking has not shown a

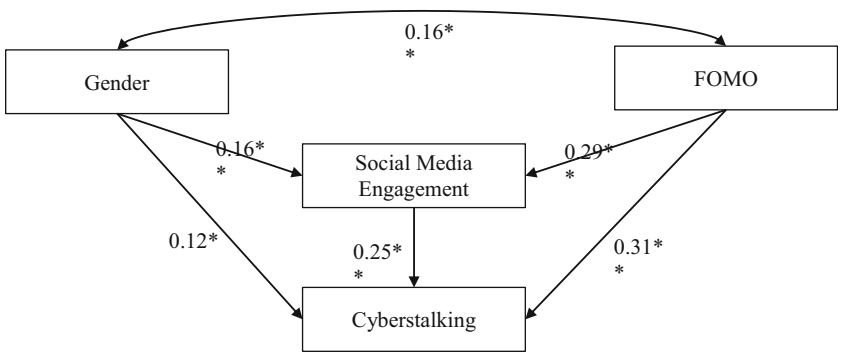

Fig. 3 Mediation Model. **Notes:** * = p < 0.05; ** = p < 0.01

relationship with the participants' relationship status. This result provides empirical evidence of the importance of studying this phenomenon in other contexts, especially as a strategy for approaching a love interest or even searching for bonds that are not romantic. Considering that people use the virtual environment to compensate for socialization difficulties in face-to-face interactions (Hood et al., 2018), this hypothesis deserves further consideration.

Cyberstalking was positively correlated with social media engagement, showing that subjects who cyberstalk more tend to also use these sites more frequently. In a survey with Brazilian Facebook users, de Oliveira et al. (2016) indicated that one of the main factors for Facebook engagement was maintaining interpersonal relationships, which can explain the relationship observed in the present study. It is important to note, however, that this relationship does not mean that using social media leads to cyberstalking, only that those who perform these behaviors need a greater use of these tools.

Additionally, cyberbullying, another antisocial online behavior also demonstrates an association with excessive internet use, indicating that since these are phenomena typical of the virtual environment, they can lead to a greater need for engagement (Jung et al., 2014). Social media engagement also mediated the relationship between FOMO/Gender and cyberstalking. Thus, it's highlighted the importance of understanding online habits when searching for antisocial online behavior predictors.

Despite these results, the present study is not without limitations. As it used a non-probabilistic sample for convenience, there was a disparity between the number of female and male participants. The extreme scarcity of studies about cyberstalking in the Brazilian context also brought difficulties in developing items proper to this reality. Even with these limitations, it is expected to have contributed to understanding cyberstalking, this new phenomenon that permeates our society.

It is also important to point out the contributions of the study, especially the evidence of FOMO's impact on cyberstalking, as well as the role of social media engagement in explaining this phenomenon. The limitation brought by Smoker & March (2017) about the scarcity of instruments related to cyberstalking was also answered. This limitation is very significant in the Brazilian context, which previously hadn't validated measures on the topic.

Why do people engage in cyberstalking? To what extent is this behavior socially accepted, or what is the threshold between acceptable and pathological/criminal? What are the consequences of cyberstalking for victims and perpetrators? And what can be done to deal with this type of behavior? Future studies may seek to answer these questions, using the Cyberstalking Scale to understand predictors, motivations, and other aspects related to this phenomenon.

Availability of Data and Material Not applicable.

Code Availability Not applicable.

Author's Contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Isabella L. Silva Santos and Tailson Evangelista Mariano. The first draft of the manuscript was written by Isabella L. Silva Santos and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Declarations

Conflicts of Interest/Competing Interests We Have no Known Conflict of Interest to Disclose.

Ethics Approval All procedures were in accordance with the ethical standards of the institutional and national research committee. The study was approved by the Centro de Ciências da Saúde da Universidade Federal da Paraíba Ethical Committee (No. 18795619.6.0000.5188).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent to Publish Participants signed informed consent regarding publishing their data.

References

Alutaybi, A., Al-Thani, D., McAlaney, J., & Ali, R. (2020). Combating fear of missing out (FoMO) on social media: The FoMO-R method. *International Journal of Environmental Research and Public Health, 17*(17), 6128. https://doi.org/10.3390/ijerph17176128.

Barlett, C. P. (2019). Cyberbullying, traditional bullying, and aggression: A complicated relationship. *Predicting Cyberbullying*, 11–16. https://doi.org/10.1016/b978-0-12-816653-6.00002-9.

Brady, P. Q., Nobles, M. R., & Bouffard, L. A. (2017). Are college students really at a higher risk for stalking?: Exploring the generalizability of student samples in victimization research. *Journal of Criminal Justice, 52*, 12–21. https://doi.org/10.1016/j.jcrimjus.2017.07.003.

Brailovskaia, J., Teismann, T., & Margraf, J. (2018). Cyberbullying, positive mental health and suicide ideation/behavior. *Psychiatry Research, 267*, 240–242. https://doi.org/10.1016/j.psychres.2018.05.074.

Byrne, B. M. (2012). *Structural equation modeling with Mplus*. New York, NY: Routledge.

Burke, S. C., Wallen, M., Vail-Smith, K., & Knox, D. (2011). Using technology to control intimate partners: An exploratory study of college undergraduates. *Computers in Human Behavior, 27*(3), 1162–1167. https://doi.org/10.1016/j.chb.2010.12.010.

Carretero-Dios, H., & Pérez, C. (2007). Standards for the development and review of instrumental studies: Considerations about test selection in psychological research. *International Journal of Clinical and Health Psychology, 7*(3), 863–882.

Choi, H., Park, J., & Jung, Y. (2018). The role of privacy fatigue in online privacy behavior. *Computers in Human Behavior, 81*, 42–51. https://doi.org/10.1016/j.chb.2017.12.001.

Dias, Camila, Oliveira-Monteiro, Nancy Ramacciotti de, & Aznar-Farias, Maria. (2014). Comportamentos antissociais e delitivos em adolescentes. Aletheia, (45), 101–113.

Duntley, J. D., & Buss, D. M. (2012). The evolution of stalking. *Sex Roles, 66*(5), 311–327. https://doi.org/10.1007/s11199-010-9832-0.

Filho, D., & Júnior, J. (2010). Visão além do alcance: uma introdução à análise fatorial. *Opinião Pública, 16*(1), 160–185. https://doi.org/10.1590/S0104-62762010000100007.

Franchina, V., Vanden Abeele, M., van Rooij, A., Lo Coco, G., & De Marez, L. (2018). Fear of missing out as a predictor of problematic social media use and Phubbing behavior among Flemish adolescents. *International Journal of Environmental Research and Public Health, 15*(10), 2319. https://doi.org/10.3390/ijerph15102319.

Hair, J. F., Anderson, R. E., & Tatham, R. L. (1987). *Multivariate data analysis with readings* (2nd ed.). New York: Macmillan Publishing Company.

Hood, M., Creed, P. A., & Mills, B. J. (2018). Loneliness and online friendships in emerging adults. *Personality and Individual Differences, 133*, 96–102. https://doi.org/10.1016/j.paid.2017.03.045.

Horsman, G., & Conniss, L. R. (2015). An investigation of anonymous and spoof SMS resources used for the purposes of cyberstalking. *Digital Investigation, 13*, 80–93. https://doi.org/10.1016/j.diin.2015.04.001.

Hu, L., & Bentler, P. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55. https://doi.org/10.1080/10705519909540118.

Jung, Y.-E., Leventhal, B., Kim, Y. S., Park, T. W., Lee, S.-H., Lee, M., Park, S., Yang, J., Chung, Y., Chung, S., & Park, J. (2014). Cyberbullying, problematic internet use, and psychopathologic symptoms among Korean youth. *Yonsei Medical Journal, 55*(3), 826–830. https://doi.org/10.3349/ymj.2014.55.3.826.

Kaur, P., Dhir, A., Tandon, A., Alzeiby, E. A., & Abohassan, A. A. (2020). A systematic literature review on cyberstalking. An analysis of past achievements and future promises. *Technological Forecasting and Social Change, 163*, 120426. https://doi.org/10.1016/j.techfore.2020.120426.

Kircaburun, K., Jonason, P. K., & Griffiths, M. D. (2018). The dark tetrad traits and problematic social media use: The mediating role of cyberbullying and cyberstalking. *Personality and Individual Differences, 135*, 264–269. https://doi.org/10.1016/j.paid.2018.07.034.

Kline, R. B. (2016). *Principles and practice of structural equation modeling*. New York: Guilford Publications.

Lowry, P., Zhang, J., Wang, C., Wu, T., & Siponen, M. (2013). Understanding and predicting cyberstalking in social media: Integrating theoretical perspectives on shame, neutralization, self-control, rational choice, and social learning. 2013 international conference on systems sciences. Doi: https://doi.org/10.13140/2.1.3361.2480.

March, E., Litten, V., Sullivan, D. H., & Ward, L. (2020). Somebody that I (used to) know: Gender and dimensions of dark personality traits as predictors of intimate partner cyberstalking. *Personality and Individual Differences, 163*, 110084. https://doi.org/10.1016/j.paid.2020.110084.

Mariano, T., Nobrega, J., Pimentel, C., Paiva, T., & Alves, T. (2019). Evidências Psicométricas do Questionário de Engajamento em Mídias Sociais. *Revista de Psicologia da IMED*, 11(2), 115–128. doi: https://doi.org/10.18256/2175-5027.2019.v11i2.3303

Maroco, J., & Garcia-Marques, T. (2006). Qual a fiabilidade do alfa de Cronbach? Questões antigas e soluções modernas? *Laboratório de Psicologia, 4*(1), 65–90. https://doi.org/10.14417/lp.763.

Marôco, J. (2010). *Análise de equações estruturais*. Lisboa, Portugal: Report Number.

Milyavskaya, M., Saffran, M., Hope, N., & Koestner, R. (2018). Fear of missing out: Prevalence, dynamics, and consequences of experiencing FOMO. *Motivation and Emotion, 42*(5), 725–737. https://doi.org/10.1007/s11031-018-9683-5.

Nikolaou, D. (2017). Does cyberbullying impact youth suicidal behaviors? *Journal of Health Economics, 56*, 30–46. https://doi.org/10.1016/j.jhealeco.2017.09.009.

de Oliveira, M. J., Huertas, M. K. Z., & Lin, Z. (2016). Factors driving young users' engagement with Facebook: Evidence from Brazil. *Computers in Human Behavior, 54*, 54–61. https://doi.org/10.1016/j.chb.2015.07.038.

Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior, 29*(4), 1841–1848. https://doi.org/10.1016/j.chb.2013.02.014.

Purcell, R., Pathé, M., & Mullen, P. E. (2001). A study of women who stalk. *American Journal of Psychiatry, 158*(12), 2056–2060. https://doi.org/10.1176/appi.ajp.158.12.2056.

Purcell, R., Pathé, M., & Mullen, P. (2010). Gender differences in stalking behaviour among juveniles. *Journal of Forensic Psychiatry and Psychology, 21*, 555–568. https://doi.org/10.1080/14789940903572035.

Revelle, W. (2021). Psych: Procedures for psychological, psychometric, and personality research. Northwestern University, Evanston, Illinois. R package version 2.1.3, https://CRAN.R-project.org/package=psych.

Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36 https://www.jstatsoft.org/v48/i02/.

Rozgonjuk, D., Sindermann, C., Elhai, J. D., & Montag, C. (2020). Fear of missing out (FoMO) and social media's impact on daily-life and productivity at work: Do WhatsApp, Facebook, Instagram and Snapchat use disorders mediate that association? *Addictive Behaviors, 106487*, 106487. https://doi.org/10.1016/j.addbeh.2020.106487.

Sheridan, L. P., & Grant, T. (2007). Is cyberstalking different? *Psychology Crime & Law, 13*(6), 627–640. https://doi.org/10.1080/10683160701340528.

Sheridan, L., & Lyndon, A. E. (2012). The influence of prior relationship, gender, and fear on the consequences of stalking victimization. *Sex Roles, 66*(5), 340–350. https://doi.org/10.1007/s111990-010-9889-9.

Smoker, M., & March, E. (2017). Predicting perpetration of intimate partner cyberstalking: Gender and the dark tetrad. *Computers in Human Behavior, 72*, 390–396. https://doi.org/10.1016/j.chb.2017.03.012.

Spitzberg, B. H., & Cupach, W. R. (2007). The state of the art of stalking: Taking stock of the emerging literature. *Aggression and Violent Behavior, 12*(1), 64–86. https://doi.org/10.1016/j.avb.2006.05.001.

Statista. (2019). Number of monthly active Instagram users from January 2013 to June 2018 (in millions). Retrieved from: https://www.statista.com/statistics/253577/number-of-monthly-active-instagram-users

Strawhun, J., Adams, N., & Huss, M. T. (2013). The assessment of cyberstalking: An expanded examination including social networking, attachment, jealousy, and anger in relation to violence and abuse. *Violence Victims, 28*(4), 715–731. https://doi.org/10.1891/0886-6708.11-00145.

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