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The Cyber Aggression in Relationships Scale: A New Multidimensional Measure of Technology-Based Intimate Partner Aggression

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Abstract

The purpose of this study was to develop and provide initial validation for a measure of adult cyber intimate partner aggression (IPA): the Cyber Aggression in Relationships Scale (CARS). Drawing on recent conceptual models of cyber IPA, items from previous research exploring general cyber aggression and cyber IPA were modified and new items were generated for inclusion in the CARS. Two samples of adults 18 years or older were recruited online. We used item factor analysis to test the factor structure, model fit, and invariance of the measure structure across women and men. Results confirmed that three-factor models for both perpetration and victimization demonstrated good model fit, and that, in general, the CARS measures partner cyber aggression similarly for women and men. The CARS also demonstrated validity through significant associations with in-person IPA, trait anger, and jealousy. Findings suggest the CARS is a useful tool for assessing cyber IPA in both research and clinical settings.

Keywords

intimate partner violence, cyber aggression, technology, item factor analysis

Recent data indicate that 91% of U.S. adults own a cell phone, 81% of cell phone owners send and receive text messages, and 73% of online adults use social media sites, such as Facebook (Duggan, 2013). These methods of communication have created a new environment for social interactions, including novel avenues for different forms of aggression to occur. Although cyber bullying among children and adolescents is common and has detrimental effects on victims (Kowalski, Giumetti, Schroeder, & Lattanner, 2014), little work has examined cyber aggression among adult intimate partners. Research examining traditional forms of intimate partner aggression (IPA; e.g., in-person physical, psychological, or sexual aggression) shows that IPA is a major public health problem that affects an alarming number of adults. Specifically, over one third of women (35.6%) and over one fourth of men (28.5%) in the United States have experienced physical, sexual, or stalking behavior by an intimate partner (Black et al., 2011), while past year prevalence rates of psychological IPA average around 80% (Carney & Barner, 2012). In addition, IPA in its various forms can inflict both psychological and physical harm to both male and female victims (Amar & Gennaro, 2005; Dillon, Hussain, Loxton, & Rahman, 2013; Kaura & Lohman, 2007). Yet measures commonly used to assess in-person adult IPA typically do not assess potentially harmful forms of IPA that are enacted through technology—known as cyber IPA. To better understand IPA in this technological age, comprehensive and valid assessment of cyber IPA is needed.

During the past decade, research has begun to explore the prevalence and impact of cyber aggression. The vast majority of this work has focused on cyber bullying among children and adolescents. Cyber bullying is widespread and affects victims negatively. Among adolescents aged 12 to 17 years, 72% reported being the target of at least one incident of online bullying (Juvonen & Gross, 2008). Similar to in-person victimization, online victimization is related to increased stress, depression symptoms, trauma symptoms, delinquency, and substance abuse among youth (Kowalski et al., 2014; Mitchell, Finkelhor, Wolak, Ybarra, & Turner, 2011; Mitchell, Ybarra, & Finkelhor, 2007). The frequency and negative effects of cyber bullying suggest a need to

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examine cyber aggression among other populations, including adult romantic partners.

Initial research has begun to highlight cyber dating aggression as a problem among adolescents and college age couples. Unlike cyber bullying, in which aggression is carried out repeatedly in an electronic context that involves an imbalance of power (Dempsey, Sulkowski, Dempsey, & Storch, 2011; Kowalski et al., 2014), cyber IPA occurs among known intimate partners and may or may not occur repeatedly. Adolescents indicate that communication through technology can facilitate escalation of conflict with partners, provide a way to intrusively monitor partners' behaviors, and facilitate interactions among estranged couples, which can result in more aggression (Draucker & Martsolf, 2010). Cyber dating aggression appears to be prevalent among adolescents, with a large portion reporting being victimized by their intimate partner. For example, Zweig, Dank, Yahner, and Lachman (2013) report that over a quarter of youth in Grades 7 to 12, who are in a current or recent intimate relationship, said they experienced some form of cyber dating aggression during the prior year. Cyber IPA is also prevalent among college students, with 93% of students reporting perpetrating and being victimized by minor cyber IPA (e.g., swearing, insulting) and 12% to 13% of students reporting severe cyber IPA (e.g., threats, public humiliation; Leisring & Giumetti, 2014). Furthermore, cyber IPA has been linked to in-person IPA perpetration and victimization among college students (Leisring & Giumetti, 2014; Marganski & Merlander, 2015; Schnurr, Mahatmya, & Basche, 2013). These initial studies on cyber IPA provide important information on the prevalence and nature of cyber IPA. However, very little is known about cyber IPA in adult relationships beyond college dating relationships, even though adults commonly perpetrate in-person IPA and also frequently use technology to communicate with their intimate partners (Coyne, Stockdale, Busby, Iverson, & Grant, 2012).

Cyber IPA has several characteristics that distinguish it from in-person IPA. First, because communication through technology does not happen in person, cyber IPA lacks the physical and social cues that occur in face-to-face interactions (Dehue, Bolman, & Völlink, 2008; Denegri-Knott & Taylor, 2005). In particular, cyber aggressors do not see victims' reactions and therefore may miss important consequences of their actions (Postmes, Spears, & Lea, 1998). Individuals may also be less inhibited in cyber interactions and may type or text things they would not say in person (Li, 2006), making it easier to perpetrate IPA through technology. Second, although cyber IPA is potentially easier to ignore than in-person IPA, many technology-based messages are relatively permanent, which allows one to look at aggressive messages repeatedly or to forward private messages to a larger audience (Runions, Shapka, Dooley, & Modecki, 2013; Slonje & Smith, 2008). In this way, cyber IPA can be witnessed by a larger group or made public, which may exacerbate victims' emotional distress beyond that experienced through in-person IPA. Finally, technology is portable, which allows perpetrators to enact aggression anywhere and reach their partner at any time, regardless of physical proximity (Runions et al., 2013). The ability to communicate instantaneously with a partner at any time may promote impulsive and reactive IPA by allowing individuals to respond without significant forethought (Runions et al., 2013). Supporting the notion that cyber aggression is a distinct form of IPA are findings with adolescents showing that cyber aggression is a separate latent construct from overt and relational aggression (Dempsey et al., 2011). The unique features of cyber aggression highlight the importance of assessing and examining it as a distinct form of IPA.

Like in-person IPA, adult cyber IPA consists of acts that are intended to cause harm to intimate partners as well as control partners' behavior. In contrast to in-person IPA, cyber IPA occurs through the use of technology, such as phones, e-mail, or social media. Existing literature has identified a range of behaviors that are indicative of cyber aggression in adolescents and young adults. Although these behaviors have not been examined outside of this age range, like in-person IPA, cyber IPA likely consists of similar behaviors across the life span. Existing findings also suggest that similar to in-person IPA, which includes sexual, psychological, and physical behaviors, cyber IPA may be multidimensional. These dimensions appear to include psychological aggression (Leisring & Giumetti, 2014), sexual aggression (Zweig et al., 2013), and cyber stalking behaviors (Schnurr et al., 2013). Psychological cyber IPA includes both use of information (e.g., pictures, video, word messages) from technology and posting or sending information through technology to cause emotional harm to one's partner. Sexual cyber IPA includes requesting or pressuring partners to send sexual content against their wishes, pressuring partners to engage in sexual acts, and sending unwanted sexual content to partners. Cyber stalking IPA includes accessing electronic devices and accounts without a partner's permission and monitoring partners through electronic devices.

In the current study, we describe the development and initial psychometric properties of the Cyber Aggression in Relationships Scale (CARS), intended to be a comprehensive measure of cyber IPA occurring between romantic partners. In the development of the CARS, we aimed to test a specific model based on prior theoretical and empirical literature. The need for such a measure is clear. First, as noted, cyber IPA is a prevalent and serious problem among intimate partners that is distinct from in-person IPA in multiple ways, rendering traditional measures of IPA unfit for studies of cyber IPA. Second, existing measures on adult cyber IPA are lacking. Previous measures have focused

exclusively on adolescents or young adults, even though technology use is common among all adults (Duggan, 2013). Furthermore, whereas previous measures have focused on specific forms of cyber IPA, such as only psychological aggression (Leisring & Giumetti, 2014), victimization experiences, (Hamby, 2013; Wolford-Clevenger et al., 2016), or certain dimensions of cyber IPA (i.e., direct and monitoring/control; Borrajo, Gamez-Guadix, Pereda, & Calvete, 2015), the CARS was developed as a multidimensional measure of cyber IPA perpetration and victimization that can aid researchers seeking to identify the prevalence and consequences of cyber IPA in a manner that is consistent across studies. Finally, among practitioners working with couples or individuals to address IPA, this measure would assist in fully assessing IPA in the age of technology.

Study 1: Factor Analytic Study

Study Overview

With Study 1, we developed and factor analyzed a cyber IPA measure. Items from previous research exploring cyber aggression and cyber IPA were adapted and modified for inclusion in the CARS. Items were selected to assess the various forms of cyber IPA that have been identified in past research including, psychological, sexual, and cyber stalking behaviors. We used item factor analysis (IFA) to examine our hypothesized factor structure and to test model fit.

Method

Participants. The study sample included 397 participants (241 women, 154 men, 2 reported neither gender) recruited through Amazon's Mechanical Turk (MTurk) system. MTurk is an online marketplace where individuals can choose to complete tasks for monetary compensation. MTurk provides samples that are somewhat more demographically diverse than standard Internet samples and data that have demonstrated internal consistency and test–retest reliability similar to data obtained through traditional methods (Buhrmester, Kwang, & Gosling, 2011). To participate in the current study, individuals had to be 18 years or older, live in the United States, and in a romantic relationship for at least 6 months. A total of 416 participants were initially recruited, but 19 participants were not included in analyses due to providing invalid data as described below. See Table 1 for sample demographics.

CARS Content and Development. In selecting items for inclusion, we prioritized those that would (a) capture the specific constructs identified in prior literature (i.e., psychological, sexual, and stalking); (b) assess the aspects of adult IPA inflicted specifically through technology (e.g., occurring not in-person; easier to ignore communications, permanency); and (c) capture that individuals can use data from technology (e.g., words, pictures, video) without a partner's permission, post/send information to hurt a partner, or pressure a partner for information that he or she does not want to send. Finally, we wanted to make the measure comparable to the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996), which is the most commonly used measure of in-person IPA, by formatting items in a similar manner.

To achieve the above aims, we reviewed existing studies examining cyber aggression and cyber IPA (i.e., Juvonen & Gross, 2008; Melander, 2010; Mitchell et al., 2011; Picard, 2007; Schnurr et al., 2013; Weathers, 2012; Zweig et al., 2013). We selected 17 behaviors that were identified and measured in this literature reflecting psychological aggression, sexual aggression, and stalking behaviors that can be enacted via use of the Internet or cell phone. We also generated two behaviors, including "intentionally ignored my partner's phone calls or text messages to hurt my partner's feelings" and "took information or images from my partner's phone, e-mail, or social media profile without his or her permission." This resulted in a total pool of 38 items reflecting 19 acts or behaviors, each assessed from a perpetration and victimization perspective. Mirroring the CTS2, we adopted response options asking participants to indicate the frequency of their own aggressive behavior toward a partner on a scale ranging from 0 (*this has never happened*) to 6 (*this has happened more than 20 times*) as well as the frequency of their partners' aggressive behavior toward them.

Intimate Partner Aggression. The 12-item physical assault, 8-item psychological aggression, and 7-item sexual coercion subscales of the CTS2 (Straus et al., 1996) were used to assess physical, psychological, and sexual IPA. These items ask participants to rate the frequency of their own and their partners' aggressive behaviors toward one another during the past 6 months. Participants rate items on a 7-point scale ranging from 0 (*this has never happened*) to 6 (*this has happened more than 20 times*). Each item that was endorsed at the level of 1 or above (i.e., 1, 2, 3, 4, 5, 6) was scored as 1; total scores were computed by summing the number of endorsed items of each subscale, with higher scores reflecting more acts of partner aggression. The current sample has alphas of .85 for physical perpetration, .85 for physical victimization, .74 for psychological perpetration, .75 for psychological victimization, .66 for sexual perpetration, and .71 for sexual victimization.

Procedure. Participants were recruited through an MTurk ad, which stated that the study was about Internet usage, emotions, and aggression in romantic relationships. After

Table 1. Study Participant Demographics.

	Study 1			Study 2		
Variable	Mean	*SD*	Range	Mean	*SD*	Range
Age in years	34.4	10.8	18-81	34.4	11.4	19-70
Relationship length (months)	74.4	84.1	6-480	73.9	97.4	6-566
Years of education	15.9	2.4	10-25	15.9	2.5	10-26
	Frequency		%	Frequency		%
Age categories						
18-21 Years old	24		5.7	29		6.4
22-30 Years old	166		39.3	191		42.0
31-40 Years old	135		32.0	119		26.2
41-60 Years old	87		20.6	102		22.4
Above 60 years old	10		2.4	14		3.1
Sexual orientation						
Straight	349		87.9	417		91.6
Gay	4		1	4		0.9
Lesbian	11		2.8	10		2.2
Bisexual	30		7.6	23		5.1
Other	3		0.8	1		0.2
Relationship description						
Married or marriage-like	181		45.6	188		41.3
Dating	111		28	137		30
Dating and living together	84		21.2	104		22.9
Engaged	21		5.3	25		5.5
Ethnicity						
Latino, Hispanic, or Spanish	36		9.1	33		7.3
African American or Black	34		8.6	45		9.9
American Indian or Alaskan Native	10		2.5	10		2.2
Asian or Pacific Islander	23		5.8	33		7.3
White	336		84.6	371		81.5
Other	13		3.3	13		2.9
Annual income ($)						
Under 20,000	110		27.7	107		23.5
20,000-30,000	81		20.4	83		18.2
30,000-50,000	103		25.9	124		27.2
50,000-70,000	55		13.9	79		17.4
Over 70,000	48		12.1	62		13.6
Country region						
Northeast	56		14.1	80		17.6
Midwest	97		24.4	90		19.8
South	160		40.3	179		39.3
West	72		18.1	95		20.9
Amount of time per day on social media						
<1 Hour	139		34.9	105		23.1
1-2 Hours	152		38.4	137		30.1
2-4 Hours	64		16.2	65		14.3
4-6 Hours	25		6.3	23		5.1
>6 Hours	17		4.2	11		2.4
Amount of time per day on e-mail						
<1 Hour	196		49.3	238		52.3
1-2 Hours	135		34	120		26.4
2-4 Hours	33		8.2	37		8.1
4-6 Hours	17		4.4	13		2.9
>6 hours	16		4.1	15		3.3

providing informed consent, participants filled out study questionnaires, and then were directed to a debriefing page, which fully described study goals and provided referral information. The study questionnaires included six questions designed to verify the legitimacy of other answers (e.g., "What is 2 + 2?"). Participants were excluded if they

Table 2. Prevalence of Intimate Partner Aggression (IPA) in the Past 6 Months.

	Study 1						Study 2					
	Perpetration			Victimization			Perpetration			Victimization		
Type of aggression	%	Mean#	*SD*	%	Mean#	*SD*	%	Mean#	*SD*	%	Mean#	*SD*
Psychological aggression	80	2.45	1.81	78	2.38	1.85	76.5	2.31	1.80	75.8	2.31	1.83
Physical aggression	21	0.45	1.38	21	0.51	1.46	22.2	0.57	1.42	22.0	0.63	1.68
Sexual aggression	28	0.45	0.95	30	0.52	1.06	26.2	0.45	0.94	31.2	0.53	1.00
Psychological cyber aggression	32.7	0.49	0.87	29.2	0.47	0.92	34.5	0.51	0.87	32.5	0.50	0.91
Sexual cyber aggression	13.6	0.21	0.62	18.1	0.25	0.62	10.8	0.15	0.49	14.3	0.22	0.65
Stalking cyber aggression	55.4	1.64	2.04	45.1	1.13	1.75	50.3	1.27	1.74	43.5	1.05	1.65

Note. Mean reflects mean number of IPA acts. Percentages refer to the proportion of individuals who endorsed each type of aggression.

missed more than one of these questions. A total of 19 participants were excluded in data analyses for this reason. Participants were paid $1.50 for study completion.

Results

Descriptive Data. The majority of participants reported using social media (73.4%), e-mail (91.9%), and text messaging (76.6%) at least once per day. Further descriptives on amount of time per day spent on social media and e-mail is displayed in Table 1. The 6-month prevalence for each type of partner aggression reported by participants is provided in Table 2. The prevalence rate for each CARS item is reported in the appendix.

Data Analytic Plan. Due to the low endorsement rates of the CARS items, responses were coded as *occurred* (1) or *did not occur* (0) during the past 6 months, similar to scoring procedures commonly used for the CTS2 (including in the current study). Because we had clear hypotheses about the factors included within our measure we used a confirmatory approach (i.e., IFAs) with items of the CARS as observed indicators. In contrast to atheoretical approaches (e.g., exploratory factor analysis), this confirmatory approach allowed us to determine the fit of our hypothesized model based on the three factors we were aiming to measure. Confirmatory approaches also permit one to test whether any model changes were necessary. IFAs were conducted using a two-parameter logistic model under WLSMV (weighted least squares means and variance adjusted), a limited-information estimator, using theta parameterization and probit link in M*plus* v. 7 (Muthén & Muthén, 1998-2012). Our model was informed by past research suggesting a multifactor structure of cyber IPA including psychological, sexual, and stalking cyber IPA behaviors. IFAs were used instead of traditional confirmatory factor analyses, because a traditional confirmatory factor analyses assumes normally distributed, continuous item responses **(**Bovaird & Koziol, 2012**)**, while IFA models are designed for categorical item responses (as was the case here). The model structure was examined for women and men collectively. Analyses were conducted separately for perpetration and victimization of cyber IPA.

The fit of the models was evaluated with the chi-square fit statistic, the comparative fit index (CFI; Bentler, 1990), the Tucker–Lewis index (TLI; Tucker & Lewis, 1973), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). Good fit of a model is generally indicated by CFI values greater than 0.95, TLI values greater than 0.95, and RMSEA values less than 0.06 (Hu & Bentler, 1999). Item parameters, including corresponding item response model parameters (discrimination and difficulty values), were reviewed to examine the properties of the CARS items. Discrimination and difficulty values can be calculated from thresholds and loadings of items and calculations depend on if one uses a logit or probit scale. Specifically, if using a logit scale, discrimination is the item's loading divided by 1.7 and difficulty is the item's threshold divided by the item's loading. If using a probit scale (as done here), discrimination equals the item's loading and difficulty is the item's threshold divided by the item's loading. Discrimination refers to how well items differentiate between individuals at varying levels of the latent trait (cyber IPA), with higher values providing more discriminative power (e.g., more information) over a smaller range of latent trait values. Generally, items with discrimination values greater than 1 are desirable (Embretson & Reise, 2000). Difficulty refers to the prevalence of the cyber IPA behavior, with the average value set at the mean ($\theta = 0$). High difficulty values indicate that the behavior is likely to be endorsed by individuals exhibiting greater levels of cyber IPA, while low values indicate frequent endorsement of the items among individuals exhibiting all levels of cyber IPA. Finally, the information distribution was examined to determine the reliability of the CARS and at which level of the latent trait the CARS measure provided the most information about perpetration and victimization (i.e., the peak of the curve). Reliability is calculated by dividing information by information plus 1.

Table 3. Assessment of Model Fit.

Model	Perpetration					Victimization				
	χ^2	*df*	CFI	TLI	RMSEA	χ^2	*df*	CFI	TLI	RMSEA
Study 1										
Psychological	5.88	5	1.00	0.99	0.02	14.51	5	0.98	0.95	0.07
Sexual	6.23	2	0.98	0.94	0.07	6.41	2	0.96	0.88	0.07
Stalking	31.71	20	1.00	0.99	0.04	40.75	20	0.99	0.98	0.05
Three-factor model	199.10	116	0.96	0.95	0.04	170.99	116	0.97	0.97	0.04
Unidimensional model	259.58	119	0.93	0.92	0.06	198.51	119	0.96	0.96	0.04
Study 2										
Three-factor model	199.58	116	0.94	0.93	0.04	155.93	116	0.97	0.97	0.03

Note. CFI = comparative fit index (values higher than 0.95 are desirable for good fit); *df* = degrees of freedom; TLI = Tucker–Lewis index (values higher than 0.95 are desirable for good fit); RMSEA = root mean square error of approximation (values lower than 0.06 are desirable for good fit).

As indicated above, we initially started with 38 items (half perpetration and half victimization). We examined factor loadings, residual correlations (high residual correlations indicate possible local dependence), and model modification indices to determine if any model changes were necessary. Four items (two behaviors measured both as perpetration and victimization) were removed due to nonsignificant factor loading or high residual correlations. These behaviors included "sharing intimate or sexual information about a partner via text or social media without permission," which had high residual correlations, and "sending an explicit or sexual photo of self to partner and knew partner did not want to see it," which had a nonsignificant factor loading. The final CARS measure consisted of 34 items (17 items each for perpetration and victimization; see the appendix).

Item Factor Analyses. IFA results confirmed that each factor (i.e., psychological, sexual, and stalking) for both cyber IPA perpetration and victimization was a good fit to the data (see Table 3). In addition, when modeled together, the expected three factors demonstrated good fit to the data (see Table 3). A nested model comparison was conducted to examine the extent to which a unidimensional model could describe the polychoric correlations among the items rather than three factors. This comparison was conducted using a chi-square difference test using the DIFFTEST option in M*plus* for the WLSMV estimator. Fit of the perpetration single factor was adequate, but was significantly worse than the three-factor model, DIFFTEST (3) = 46.48, $p < .001$. For victimization, fit of the single factor was good, but also significantly worse than the three-factor model, DIFFTEST (3) = 23.85, $p < .001$.

In the three-factor model, each item had a significant theta loading. As shown in Table 3, the χ^2 was significant for the model for perpetration ($\chi^2 = 199.10$, $p < .01$) and victimization ($\chi^2 = 171.84$, $p < .01$). Furthermore, the CFI (0.96 for perpetration, 0.97 for victimization), TLI (0.95 for perpetration, 0.97 for victimization), and RMSEA (0.04 for perpetration, 0.04 for victimization) all indicate that both three-factor models demonstrate good fit. Theta loadings, thresholds, and standard errors were also assessed and values were all acceptable, indicating no localized strains in the perpetration and victimization models. In the three-factor model, the correlations between factors were as follows: .76 for stalking and psychological, .79 for stalking and sexual, and .91 for psychological and sexual.

Item discrimination and difficulty parameters are reported in Table 4. Overall, these items provide adequate discrimination, while the difficulty values reflect the CARS's measure of perpetration and victimization has a medium difficulty level. The stalking subscale provided the largest range of difficulty levels. The information distributions, which are displayed in Figures 1, 2, and 3, were examined for each factor. Information curves describe how reliable each subscale is over the range of theta. These curves revealed that the CARS psychological factor has over 80% reliability (i.e., when the information value is above 4) for individuals who are approximately 1.3 to 2.5 standard deviations above the mean in perpetration and who are approximately 0.4 to 2.5 standard deviations above the mean in victimization (see Figure 1). The CARS stalking factor has over 80% reliability for individuals who are approximately 0 to 1.7 standard deviations above the mean in perpetration and who are approximately 0.5 to 2.5 standard deviations above the mean in victimization (see Figure 2). The CARS sexual factor has over 80% reliability for individuals who are approximately 1 to 2.8 standard deviations above the mean in perpetration and victimization (see Figure 3).

Correlations between the CARS subscales, in-person IPA, and age are presented in Table 5. We included age because younger age is associated with higher rates of in-person IPA (Stith, Smith, Penn, Ward, & Tritt, 2004) and we wanted to examine the relationship between age and cyber IPA. These results show moderate to strong positive relations between

Table 4. Study 1 Item Discrimination, Difficulty, and R^2 Parameters for Cyber Aggression in the Past 6 Months.

	Perpetration				Victimization			
Item	Std. loading	R^2	Discrimination	Difficulty	Std. loading	R^2	Discrimination	Difficulty
Psychological cyber aggression subscale								
1. Used information posted on social media to put down or insult my partner.	.88	.77	1.83	1.79	.84	.70	1.52	1.86
4. Shared private or embarrassing information about my partner via text or social media without his or her permission.	.70	.49	0.98	1.97	.85	.73	1.64	1.79
10. Sent threatening or harassing messages to my partner via text or social media.	.78	.61	1.25	2.27	.84	.70	1.52	2.03
11. Wrote or posted content on social media that I knew would hurt my partner's feelings.	.87	.75	1.74	1.95	.89	.79	1.96	1.77
17. Intentionally ignored my partner's phone calls or text messages to hurt my partner's feelings	.62	.39	0.79	1.03	.69	.47	0.94	1.01
Sexual cyber aggression subscale								
3. Asked my partner online for sexual information about himself or herself when my partner did not want to tell.	.84	.70	1.52	2.13	.76	.58	1.18	2.37
7. Posted a sexually suggestive message or picture to my partner's online profile that she or he did not want.	.90	.80	2.01	2.19	.78	.62	1.27	2.35
8. Pressured my partner to send sexual or naked photos of him or her to me.	.81	.66	1.38	1.61	.67	.45	0.91	1.66
16. Tried to make my partner talk about sex online when he or she did not want to.	.90	.80	2.00	1.86	.89	.79	1.93	1.82
Stalking cyber aggression subscale								
2. Checked my partner's e-mail account to see who he or she was talking to or e-mailing without my partner's knowledge.	.86	.74	1.68	0.98	.94	.89	2.84	1.22
5. Kept tabs on the whereabouts of my partner using social media.	.70	.49	0.98	0.73	.72	.52	1.04	1.00
6. Checked my partner's phone to see who he or she was talking to or texting without my partner's permission.	.86	.74	1.69	0.42	.83	.70	1.51	0.84
9. Checked or tracked my partner's Internet activity without their permission.	.94	.87	2.64	0.59	.90	.82	2.10	1.03
12. Used my partner's social media account to view his or her activity without my partner's permission.	.93	.86	2.46	0.83	.90	.80	2.02	1.38
13. Sent repeated online messages or texts asking about my partner's location or activities.	.54	.29	0.64	1.81	.59	.35	0.74	1.50
14. Used GPS technology to track my partner's location without my partner's permission.	.77	.60	1.22	2.26	.89	.80	1.99	2.02
15. Took information or images from my partner's phone, e-mail, or social media profile without his or her permission.	.78	.61	1.25	2.01	.77	.59	1.21	2.54

Note. Std. = standardized. R^2 values denote the amount of item variance accounted for by theta.

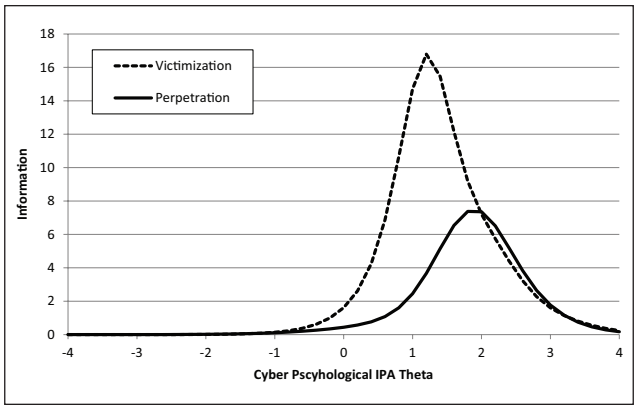

Figure 1. Test information for cyber psychological IPA perpetration and victimization.
Note. IPA = intimate partner aggression. Factors have over 80% reliability when the information value is above 4.

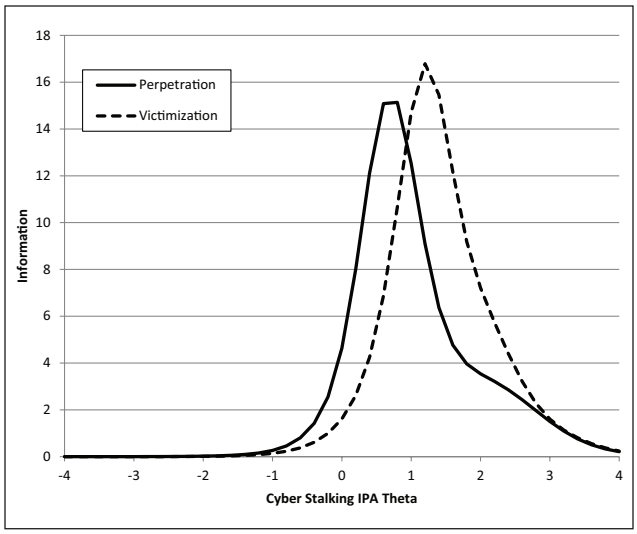

Figure 2. Test information for cyber stalking IPA perpetration and victimization.
Note. IPA = intimate partner aggression. Factors have over 80% reliability when the information value is above 4.

the three CARS subscales and each of the CTS2 subscales, with correlations ranging from .28 to .65. Cyber IPA and age correlations ranged from −.11 to −.18 and in-person IPA and age correlations ranged from −.10 to −.15.

Study 2: Replication, Gender Invariance, and Construct Validation

Study Overview

Given that a reliable three-factor measure of cyber IPA was established in Study 1, the aims of Study 2 were to (a) determine if the factor model found in the first study was replicable,

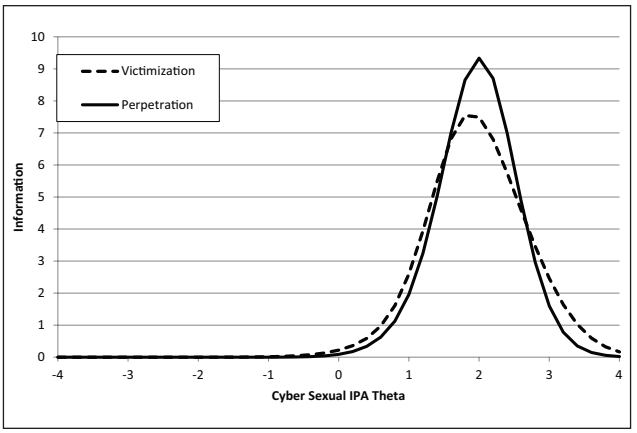

Figure 3. Test information for cyber sexual IPA perpetration and victimization.
Note. IPA = intimate partner aggression. Factors have over 80% reliability when the information value is above 4.

(b) test gender invariance, and (c) evaluate convergent validity of the CARS. Several constructs were chosen to evaluate convergent validity of the CARS. Although in-person IPA is distinct from cyber IPA, we expected in-person IPA to correlate with cyber forms. In addition, we included several constructs that prior research has repeatedly linked to in-person IPA and that we expected would also be related to cyber IPA, including trait anger (Eckhardt, Jamison, & Watts, 2002; Maldonado, Watkins, & DiLillo, 2015), relationship jealousy (Foran & O'Leary, 2008b), alcohol use (Foran & O'Leary, 2008a), and mental health problems (Coker et al., 2002). Finally, relationship satisfaction has been negatively correlated with in-person IPA in prior research (Stith, Green, Smith, & Ward, 2008), and we would expect the same to be true for cyber IPA.

Method

Participants. The Study 2 sample included 455 participants (284 women, 167 men, 1 transgender female to male, 1 transgender male to female, and 2 reported no gender), recruited again through MTurk, but at a later time than the Study 1 sample. To be eligible, individuals had to be 18 years or older, living in the United States, and in a romantic relationship for at least 6 months. A total of 473 participants were initially recruited, but 18 participants were not included in analyses because they provided invalid data (e.g., answered more than one of the validity items incorrectly). Participant demographic descriptives are displayed in Table 1.

Measures

CARS. The 34 item three-factor measure developed in Study 1 was used in Study 2.

Internet and text usage. Participants indicated how often they used social media, e-mail, and texting on three items. If

Table 5. Correlations Between Cyber IPA, In-Person IPA, and Age (Study 1).

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. CARS psych. perp.	—											
2. CARS sexual perp.	.73**	—										
3. CARS stalking perp.	.60**	.56**	—									
4. CARS psych. vic.	.85**	.71**	.61**	—								
5. CARS sexual vic.	.69**	.82**	.58**	.71**	—							
6. CARS stalking vic.	.67**	.63**	.77**	.70**	.70**	—						
7. CTS2 psych. perp.	.43**	.37**	.35**	.45**	.34**	.39**	—					
8. CTS2 physical perp.	.56**	.65**	.37**	.47**	.57**	.45**	.50**	—				
9. CTS2 sexual perp.	.43**	.59**	.32**	.41**	.47**	.40**	.31**	.51**	—			
10. CTS2 psych. vic.	.34**	.28**	.36**	.43**	.32**	.42**	.81**	.43**	.25**	—		
11. CTS2 physical vic.	.45**	.54**	.38**	.49**	.54**	.49**	.43**	.71**	.51**	.59**	—	
12. CTS2 sexual vic.	.38**	.50**	.30**	.40**	.50**	.42**	.37**	.59**	.71**	.49**	.64**	—
13. Age	−.16**	−.15**	−.18**	−.12*	−.16**	−.11*	−.15**	−.11*	−.14**	−.10	−.11*	−.13*

Note. IPA = intimate partner aggression; CARS = Cyber Aggression in Relationships Scale; Psych. = psychological; Perp. = perpetration; Vic. = victimization; CTS2 = Revised Conflict Tactics Scale.
*$p < .05$. **$p < .001$.

an individual indicated he or she used any of these technologies daily or almost daily, a follow-up question was asked to determine how many hours a day they spent interacting through this particular technology.

Intimate partner aggression. The same subscales of the CTS2 (Straus et al., 1996) were used to assess physical, psychological, and sexual IPA. This sample has alphas of .81 for physical perpetration, .87 for physical victimization, .72 for psychological perpetration, .73 for psychological victimization, .66 for sexual perpetration, and .64 for sexual victimization.

Trait anger. The trait anger subscale of the State–Trait Anger Expression Inventory–II (STAXI-II; Spielberger, 1999) contains 10 items that assess the frequency of experiencing angry feelings or reactions over time. Items are scored from 0 (*almost never*) to 4 (*almost always*), with higher scores indicating a greater tendency to experience anger. The STAXI-II trait anger subscale has demonstrated strong psychometric properties, including high reliability (Eckhardt, Norlander, & Deffenbacher, 2004; Spielberger, 1999). The alpha for the trait anger subscale was .88 for the current sample.

Relationship jealousy. A modified version of the Interpersonal Jealousy Scale (IJS; Mathes & Severa, 1981) was used to assess relationship jealousy. The IJS has 27 items, which are rated on a scale from 1 (*absolutely false/disagree completely*) to 9 (*absolutely true/agree completely*). The IJS has demonstrated good internal consistency reliability and convergent validity (Dutton, van Ginkel, & Landolt, 1996; Rotenberg, Shewchuk, & Kimberley, 2001). In the current study, the IJS was modified so that the items would be relevant to individuals in same-sex relationships instead of only heterosexual dyads. For example, "If my partner admired someone of the opposite sex, I would feel irritated" was changed to "If my partner admired someone attractive, I would feel irritated." The alpha for the current sample was .93.

Alcohol use. Alcohol use was measured with the 10-item Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The AUDIT measures three aspects of drinking, including quantity and frequency of drinking, symptoms of dependence, and problems caused by alcohol use. The alpha for the AUDIT in the current sample was .80.

Mental health problems. The Depression Anxiety Stress Scales (Henry & Crawford, 2005) was used to assess depression, anxiety, and stress symptoms. Respondents indicate how often they experience symptoms during the previous week on a scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). In the current sample, the depression scale alpha was .91, the anxiety alpha was .84, and the stress alpha was .86.

Relationship satisfaction. The six-item Quality of Marriage Index (Norton, 1983) was used to assess relationship satisfaction. Participants answer five times about their relationship (e.g., "Our relationship is strong") on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Then, participants rate their degree of happiness in their relationship on a scale from 1 (*very unhappy*) to 10 (*very happy*). The alpha for the Quality of Marriage Index in the current sample was .95.

Results

Descriptive Data and Model Replication. The majority of participants reported using social media (74.9%), e-mail (93%), and text messaging (81.3%) at least once per day. Further descriptives on amount of time per day spent on social media and e-mail are displayed in Table 1. The 6-month prevalence for each type of partner aggression reported by participants is provided in Table 2.

In Study 2, we replicated the three-factor model found in Study 1. As shown in Table 3, the χ^2 was significant for the model for perpetration ($\chi^2 = 199.58$, $p < .01$) and victimization ($\chi^2 = 155.93$, $p < .01$). Furthermore, the CFI (0.94 for perpetration, 0.97 for victimization), TLI (0.93 for perpetration, 0.97 for victimization), and RMSEA (0.04 for perpetration, 0.03 for victimization) indicate that both three-factor models demonstrate good fit.

Gender Invariance. The extent to which the three-factor models measuring cyber IPA perpetration and victimization exhibit invariance across gender was examined. Nested model comparisons were conducted using the DIFFTEST procedure. To establish measurement invariance, we used multiple group testing. First, a configural invariance model was initially specified as a baseline in which each factor was estimated simultaneously for both women and men (the three participants who identified as transgender or did not report their gender were not included in these analyses). The factor variance was fixed to 1 and the factor mean was fixed to 0 for each gender for identification, such that all item factor loadings and thresholds were then estimated. The residual variances are not uniquely identified in the configural invariance model and therefore were all constrained to 1 for both genders. For the victimization model, one item ("Posted sexually suggestive message or picture on profile") was removed from invariance testing analyses due to the invariance models being nonestimable when this item was included. Configural invariance was supported for both perpetration (χ^2 [232] = 304.79,

Table 6. Study 2: Metric Invariance Model.

	Both genders	Women			Men		
Item number	Discrimination	Difficulty	Std. loading	R^2	Difficulty	Std. loading	R^2
Perpetration							
Psychological							
1	1.23	0.90	0.78	.60	1.81	0.69	.48
4	2.03	2.06	0.90	.80	1.11	0.84	.71
10	1.58	1.92	0.85	.71	1.89	0.78	.60
11	4.34	1.81	0.97	.95	1.31	0.96	.92
17	0.91	0.75	0.67	.46	2.14	0.58	.34
Sexual							
3	0.77	3.32	0.61	.37	3.19	0.59	.35
7	3.31	2.29	0.96	.92	1.68	0.95	.71
8	0.93	2.72	0.68	.46	1.57	0.66	.44
16	1.68	2.56	0.86	.74	1.76	0.85	.72
Stalking							
2	1.54	1.08	0.84	.70	1.54	0.88	.77
5	0.83	1.34	0.64	.41	1.26	0.70	.35
6	1.22	0.59	0.77	.60	1.10	0.82	.68
9	1.86	0.92	0.88	.78	1.05	0.91	.83
12	1.66	1.08	0.86	.73	1.41	0.89	.79
13	0.66	1.74	0.55	.30	2.26	0.61	.38
14	1.00	2.63	0.71	.50	2.67	0.76	.58
15	1.18	2.12	0.76	.58	2.12	0.81	.66
Victimization							
Psychological							
1	1.60	2.08	0.85	.72	0.75	0.79	.63
4	1.53	2.28	0.84	.70	1.25	0.78	.61
10	2.91	1.87	0.95	.90	1.32	0.92	.85
11	1.80	2.12	0.87	.76	1.39	0.82	.68
17	1.11	0.85	0.74	.55	0.67	0.67	.45
Sexual							
3	2.60	1.89	0.93	.87	1.10	0.78	.60
7	—	—	—	—	—	—	—
8	1.70	1.43	0.86	.70	1.07	0.63	.39
16	3.54	1.59	0.96	.74	0.92	0.86	.74
Stalking							
2	1.78	1.31	0.87	.76	1.15	0.90	.82
5	0.97	1.33	0.70	.48	1.24	0.76	.57
6	1.52	0.93	0.84	.70	0.94	0.88	.77
9	1.55	1.42	0.84	.70	1.18	0.88	.77
12	1.45	1.52	0.82	.68	1.46	0.87	.75
13	0.65	1.97	0.54	.30	1.97	0.61	.37
14	0.36[a]	5.81	0.34	.11	12.79	0.91	.83
15	1.39	2.29	0.81	.66	1.98	0.86	.73

Note. Std. = standardized. In the metric invariance model, discrimination is held constant across genders. R^2 values denote the amount of item variance accounted for by theta.

[a]The loading of this item was freed across genders. The value for women is displayed in the table and the value for men is 1.88.

CFI = 0.95, TLI = 0.94, RMSEA = 0.04) and victimization (χ^2 [202] = 249.80, CFI = 0.97, TLI = 0.96, RMSEA = 0.03), indicating that the CARS measures the cyber IPA structure similarly across genders. Next, equality of the unstandardized item factor loadings between genders was examined in a metric invariance model. The discrimination, difficulty, standardized loadings, and R^2 values for the metric invariance model are displayed in Table 6. The factor variance was fixed to 1 for the women for identification but was freely estimated for the men; the

factor mean was fixed to 0 for both genders for identification. All factor loadings were constrained to be equal across gender, all item thresholds were estimated, and all residual variances were constrained to 1 across gender. The metric invariance model did not fit differently from the configural invariance model for perpetration, DIFFTEST (14) = 16.69, p = .27, demonstrating that perpetration on the CARS is measured in the same way across women and men. However, the metric invariance model did fit differently from the configural invariance model for victimization, DIFFTEST (13) = 23.91, p = .04. The modification indices suggested that the item "Used GPS to track" was the largest source of misfit and its loading should be freed. After doing so, the partial metric invariance model did not fit differently from the configural model, DIFFTEST (12) = 15.27, p = .23.

Finally, equality of the unstandardized item thresholds across gender was examined in a scalar invariance model. The factor variance and mean were fixed to 1 and 0, respectively, for the women for identification, but the factor variance and mean were estimated for the men. All factor loadings and item thresholds were constrained equal across gender; all residual variances were still constrained equal to 1 for both gender. The scalar invariance model fit differently from the metric invariance model for both perpetration, DIFFTEST (17) = 37.56, p = .003, and victimization, DIFFTEST (16) = 30.84, p = .01. Inspection of the modification indices did not suggest any points of localized misfit. Therefore, while metric invariance was established for both partner cyber aggression perpetration and victimization, scalar invariance was not. These results suggest that the CARS is measuring cyber IPA perpetration and victimization in the same way for both women and men; however, comparing mean differences of cyber IPA scores across gender is not recommended.

Construct Validity. Bivariate correlations (see Table 7) were conducted to examine the associations between cyber IPA, in-person IPA, and age. Associations between cyber IPA and the constructs of trait anger, relationship jealousy, relationship satisfaction, alcohol use, and mental health were also examined (see Table 8).

Consistent with Study 1, results from Study 2 demonstrated that each form of cyber IPA was significantly associated with each form of in-person IPA, and that age was negatively related to several forms of cyber IPA and in-person IPA. In addition, as expected, psychological and stalking cyber IPA were positively related to trait anger, relationship jealousy, alcohol use, and mental health problems and negatively related to relationship satisfaction. Sexual cyber IPA was related to all study variables except sexual cyber perpetration was not related to jealousy or relationship satisfaction, and sexual cyber victimization was not related to jealousy or alcohol use.

To further examine evidence of validity, correlations were compared to determine whether the strongest correlations were between similar subscales of the CARS and CTS2. Results indicated that, for both perpetration and victimization, the relationships between the CARS psychological subscales and in-person psychological IPA were significantly stronger than the relationships between the CARS psychological subscales and in-person physical IPA (Z = 6.44, p < .001 for perpetration and Z = 2.85, p < .01 for victimization) and in-person sexual IPA (Z = 5.83, p < .001 for perpetration and Z = 4.49, p < .001 for victimization). These results suggest that the CARS psychological subscales measure a construct more similar to in-person psychological IPA than other forms of in-person IPA.

Similarly, for both perpetration and victimization, the relationships between the CARS stalking IPA and in-person psychological IPA were significantly stronger than the relationships between the CARS stalking subscales and in-person physical IPA (Z = 6.68, p < .001 for perpetration and Z = 4.00, p < .001 for victimization) and in-person sexual IPA (Z = 6.40, p < .001 for perpetration and Z = 6.11, p < .001 for victimization). These findings suggest that the CARS stalking subscales measure a construct more similar to in-person psychological IPA than other forms of in-person IPA.

The relationship between CARS sexual perpetration subscale and in-person sexual IPA perpetration was not significantly different from the relationship between the CARS sexual perpetration subscale and in-person psychological IPA (Z = 1.09, p = .27) and in-person physical IPA (Z = 1.60, p = .11). This finding suggests the CARS sexual IPA perpetration is not more similar to in-person sexual IPA than other forms of in-person IPA. The relationship between the CARS sexual victimization subscale and in-person sexual IPA victimization was stronger than the relationship between CARS sexual victimization and in-person physical IPA (Z = 2.50, p = .01), but not significantly different from the relationship between CARS sexual victimization and in-person psychological IPA (Z = 1.84, p = .07).

Discussion

The purpose of this study was to develop and provide initial psychometric information for a measure of cyber IPA, the CARS. Although past research has shown that cyber aggression is a serious problem among adolescents (Kowalski et al., 2014), few studies have examined cyber aggression among adult intimate partners. Consistent with studies examining cyber IPA among college students (e.g., Leisring & Giumetti, 2014; Schnurr et al., 2013), the current findings showed that a substantial proportion of adults reported experiencing either cyber IPA perpetration or victimization. These data suggest that cyber IPA is a frequent occurrence and highlight the need for valid and comprehensive

Table 7. Correlations Between Cyber IPA, In-Person IPA, and Age (Study 2).

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. CARS psych. perp.	—											
2. CARS sexual perp.	.35**	—										
3. CARS stalking perp.	.52**	.32**	—									
4. CARS psych. vic.	.71**	.33**	.47**	—								
5. CARS sexual vic.	.42**	.42**	.35**	.38**	—							
6. CARS stalking vic.	.43**	.43**	.69**	.50**	.26**	—						
7. CTS2 psych. perp.	.50**	.23**	.45**	.40**	.27**	.37**	—					
8. CTS2 physical perp.	.20**	.21**	.13**	.18**	.14**	.13**	.39**	—				
9. CTS2 sexual perp.	.20**	.29**	.14**	.23**	.17**	.10*	.25**	.38**	—			
10. CTS2 psych. vic.	.40**	.18**	.38**	.44**	.15**	.48**	.81**	.33**	.23**	—		
11. CTS2 physical vic.	.25**	.24**	.16**	.31**	.13**	.30**	.33**	.75**	.39**	.42**	—	
12. CTS2 sexual vic.	.22**	.20**	.18**	.21**	.25**	.17**	.28**	.36**	.74**	.29**	.45**	—
13. Age	−.07	−.13**	−.10*	−.06	−.09	−.05	−.10*	−.13**	−.02	−.05	−.09*	.002

Note. IPA = intimate partner aggression; CARS = Cyber Aggression in Relationships Scale; Psych. = psychological; Perp. = perpetration; Vic. = victimization; CTS2 = Revised Conflict Tactics Scale.
*$p < .05$. **$p < .001$.

Table 8. Correlations Between Cyber IPA and Other Variables in Study 2.

Measure	1	2	3	4	5	6	7	8	9	10
1. CARS psych. perp.	—									
2. CARS sexual perp.	.35**	—								
3. CARS stalking perp.	.52**	.32**	—							
4. CARS psych. vic.	.71**	.33**	.47**	—						
5. CARS sexual vic.	.42**	.42**	.35**	.38**	—					
6. CARS stalking vic.	.43**	.43**	.69**	.50**	.26**	—				
7. Relationship jealousy	.18**	.002	.31**	.10*	.02	.14**	—			
8. Trait anger	.25**	.16**	.22**	.18**	.14**	.11*	.40**	—		
9. Relationship satisfaction	−.31**	−.06	−.22**	−.38**	−.14**	−.31**	−.27**	−.05	—	
10. Alcohol use	.19**	.24**	.21**	.23**	.08	.25**	.18**	.17**	.11*	—
11. DASS total	.27**	.12**	.19**	.21**	.20**	.17**	.28**	.16**	.05	.26**

Note. IPA = intimate partner aggression; CARS = Cyber Aggression in Relationships Scale; Psych. = psychological; Perp. = perpetration; Vic. = victimization; DASS = Depression Anxiety Stress Scales.
*$p < .05$. **$p < .001$.

measurement of this form of aggression. Evidence that the CARS represents a valid and psychometrically sound measure of cyber IPA is discussed below.

The results of our IFA support the internal consistency and reliability of the CARS and suggested that a three-dimensional model was a good fit for both cyber IPA perpetration and victimization. Specifically, the items on the CARS were best represented by three factors reflecting psychological, sexual, and stalking behaviors, for both perpetration and victimization. This factor structure corresponds to our predicted model and aligns with existing conceptualizations of cyber IPA (e.g., Borrajo et al., 2015; Zweig et al., 2013). In addition, results demonstrated that the CARS is a reliable measure of cyber IPA, particularly among individuals who perpetrate or experience average to high levels of cyber IPA. The CARS is more limited in its ability to measure low levels of aggression. These findings are consistent with analysis examining the CTS2, which also show it is best at measuring in-person IPA at moderate to high levels (Jose, Olino, & O'Leary, 2012). Given that aggression data are inherently positively skewed (i.e., most people are not aggressive), it is not surprising that measures assessing aggressive acts are more reliable at higher levels of aggression.

In Study 2, we recruited a second sample to examine gender equivalence. Results showed that the same factors were being measured similarly across genders, indicating that the CARS can be used to measure cyber IPA among both women and men. However, findings suggested that the cyber IPA construct does not account for the item mean differences across women and men. Thus, although the CARS can be used to assess cyber IPA perpetration and victimization consistently among both women and men, comparing item mean scores across genders is not recommended. This means that one should not evaluate factor mean differences across sexes, because women and men's responses significantly differ for at least one of the measure items. It is also worth noting that the victimization analyses were conducted without one sexual victimization item due to estimation problems. Therefore, caution should be used if comparing the sexual cyber IPA victimization factor across genders.

This study also provides preliminary evidence for the construct validity of CARS. As expected, both perpetration and victimization on the three CARS factors were positively related to in-person IPA. Although in Study 1, associations of similar magnitude were found across CARS and CTS2 subscales, results from Study 2 revealed that the strongest correlations tended to be between similar subscales of the CARS and CTS2. For example, in Study 2, psychological aggression perpetration and victimization on the CARS showed the strongest associations with the psychological aggression perpetration and aggression subscales of the CTS2, respectively. Likewise, in Study 2, CARS stalking perpetration and victimization experiences (which are characterized by psychological control and intimidation) showed the strongest correlations with CTS2 psychological aggression perpetration and victimization scores, respectively. Although the CARS sexual subscales were significantly related to in-person sexual IPA, in general, they were not more strongly related to in-person sexual IPA than to other forms of in-person IPA. This finding deserves further exploration, but suggests that those who engage in cyber sexual IPA are more likely to engage in all forms of in-person IPA (not just sexual IPA). Future work could examine whether certain acts of cyber sexual IPA are differentially related to specific types of in-person sexual IPA versus in-person IPA more generally. Overall, the positive associations between cyber and in-person aggression (Study 1), and particularly the more specific associations between similar subscales on the CARS and CTS2 (Study 2), lend support for the construct validity of the CARS subscales.

Overall, the CARS factors were also positively associated with related constructs, including trait anger, jealousy, alcohol use, and overall mental health problems, which have all been linked to in-person IPA (Coker et al., 2002; Eckhardt et al., 2002; Foran & O'Leary, 2008a, 2008b; Maldonado et al., 2015). Furthermore, providing evidence for validity, all CARS factors except sexual perpetration were negatively related with relationship satisfaction. Several other nonsignificant associations also emerged. Sexual cyber IPA perpetration and victimization were not related to jealousy, and cyber sexual victimization was not related to alcohol use. The reason for these lack of associations is unclear; however, it may be that some individuals perceive and intend these sexual IPA acts to be flirtation rather than aggression per se (e.g., perpetrator wants partner to engage in cybersex, but the partner does not want to). Thus, although overall these associations offer preliminary evidence that the CARS is a valid assessment of cyber IPA, research is needed to further examine the association of the CARS with additional related constructs, such as emotion dysregulation, posttraumatic stress disorder symptoms, and drug use.

In addition to providing initial psychometric support for the CARS, results from this study offer new information on cyber IPA among adults. As indicated above, a high proportion of adults reported experiencing at least one act of cyber IPA. Six-month rates were highest for stalking cyber IPA (50% to 55% reporting perpetration and 44% to 45% reporting victimization), lowest for sexual cyber IPA (10% to 13% reporting perpetration and 14% to 18% reporting victimization), with rates of psychological cyber IPA falling in between (32% to 34% reporting perpetration and 29% to 32% reporting victimization). Overall, these prevalence rates are similar to those found in prior research (e.g., Borrajo et al., 2105;

Zweig et al., 2014). In addition, reports of cyber IPA perpetration and victimization were highly related, suggesting that cyber IPA may be frequently bidirectional. This possibility is consistent with research demonstrating that in-person IPA is also bidirectional much of the time (Renner & Whitney, 2012). This bidirectionality suggests that intervention and prevention programs should consider that individuals experiencing cyber IPA are likely to be both perpetrators and victims.

We offer several interpretation and scoring recommendations for those using the CARS. First, because the multidimensional model fit better than the unidimensional model, we recommend researchers and treatment providers use the subscales rather than a total score. Second, similar to the CTS, there are multiple ways in which one could score the items of the CARS. In the current study, we summed the number of endorsed items. This scoring method will likely be appropriate for general population samples similar to the one used here, where endorsement of items is generally low. Another potential method for scoring the CARS involves the use of frequency scores, which are computed to estimate the total number of aggressive incidents. Frequency scores are computed by estimating frequencies for each response category: "3 to 5" is treated as 4, "6 to 10" is treated as 8, "11 to 20" is treated as 15, and "more than 20" as 25. Using the frequency scoring method may be useful when examining IPA in settings where perpetration and victimization is more prevalent than general population samples (e.g., inmates, shelter samples, or those adjudicated for IPA perpetrations). Future research could examine these different scoring methods among at-risk samples.

Limitations of the present study should be noted. First, although participants came from two fairly large, geographically diverse samples, our recruitment through MTurk may have resulted in a sample of individuals who use the Internet and other technology more than other adults. Future studies should examine the reliability and validity of the CARS with a sample recruited through different methods (e.g., community or help-seeking individuals). A second limitation is that participants in the current studies were in dating relationships for at least 6 months and reported on acts of cyber IPA occurring during that time period. Because acts such as online stalking may also occur with ex-partners, future research is needed to assess cyber IPA under those circumstances. Finally, it will also be important to evaluate the CARS among couples (i.e., acquire both partners' reports of perpetration and victimization), which will allow researchers to examine concordance among partners.

Limitations notwithstanding, the CARS is a relatively brief and psychometrically sound measure of cyber IPA that can be completed quickly (in approximately 5 minutes) and in conjunction with measures of traditional IPA (e.g., CTS2) to assess all forms of IPA. In a research context, the CARS can be used to help build a stronger knowledge base regarding the prevalence and consequences of cyber IPA perpetration and victimization in adult populations. Likewise, clinicians working with individuals or couples at risk for partner aggression may find the CARS valuable in identifying acts of cyber aggression that are not explicitly assessed by more traditional IPA measures. Finally, when assessing both in-person and cyber IPA, researchers and clinicians may want to alter in-person IPA measures' instructions to indicate that respondents should only report on noncyber aggression, thus avoiding unintended redundancy across measures.

Appendix

Cyber Aggression in Relationships Scale With Item Frequencies

No matter how well a couple gets along, there are times when they disagree or get angry or upset with each other. During these times, some couples express themselves through technology including social media (e.g., Facebook, Twitter, Instagram, blog) and cell phones (e.g., texting). We are interested in how often this happens in your relationship. Please read the list below of different things that might have happened in your relationship. Please circle how many times you did each of these things in the past 6 months, and how many times your partner did them in the past 6 months. If these things did not happen in the past 6 months, but did happen before, please circle 7.

How often did this happen?

0 = This has never happened
1 = Once in the past 6 months
2 = Twice in the past 6 months
3 = 3-5 Times in the past 6 months
4 = 6-10 Times in the past 6 months
5 = 11-20 Times in the past 6 months
6 = More than 20 times in the past 6 months
7 = Not in the past 6 months, but it did happen before

Items	Study 1	Study 2
1a. I used information posted on social media to put down or insult my partner.	34 (8.1%)	27 (5.9%)
1b. My partner used information posted on social media to put me down or insult me.	36 (8.5%)	30 (6.6%)
2a. I checked my partner's e-mail account to see who he or she was talking to or e-mailing without my partner's permission.	78 (18.5%)	73 (16.0%)
2b. My partner checked my e-mail account to see who I was talking to or e-mailing without my permission.	86 (20.4%)	68 (14.9%)
3a. I asked my partner online for sexual information about himself or herself when my partner did not want to tell.	27 (6.4%)	10 (2.2%)
3b. My partner asked me online for sexual information about myself when I did not want to tell.	23 (5.5%)	17 (3.7%)
4a. I shared private or embarrassing information about my partner via text or social media without his or her permission.	44 (10.45)	28 (6.2%)
4b. My partner shared private or embarrassing information about myself via text or social media without my permission.	34 (8.1%)	27 (5.9%)
5a. I kept tabs on the whereabouts of my partner using social media.	134 (31.8%)	95 (20.9%)
5b. My partner kept tabs on my whereabouts using social media.	104 (24.6%)	85 (18.7%)
6a. I checked my partner's phone to see who he or she was talking to or texting without my partner's permission.	91 (21.6%)	129 (28.4%)
6b. My partner checked my phone to see who I was talking to or texting without my permission.	64 (15.2%)	104 (22.9%)
7a. I posted a sexually suggestive message or picture to my partner's online profile that she or he did not want.	21 (5.0%)	12 (2.6%)
7b. My partner posted a sexually suggestive message or picture to my online profile that I did not want.	25 (5.9%)	13 (12.9%)
8a. I pressured my partner to send sexual or naked photos of him or her to me.	50 (11.8%)	33 (7.3%)
8b. My partner pressured me to send sexual or naked photos of myself to him or her.	64 (15.2%)	45 (9.9%)
9a. I checked or tracked my partner's Internet activity without his or her permission.	127 (30.1%)	94 (20.7%)
9b. My partner checked or tracked my Internet activity without my permission.	82 (19.4%)	65 (14.3%)
10a. I sent threatening or harassing messages to my partner via text or social media.	25 (5.9%)	20 (4.4%)
10b. My partner sent threatening or harassing messages to me via text or social media.	28 (6.6%)	22 (4.8%)
11a. I wrote or posted content on social media that I knew would hurt my partner's feelings.	28 (6.6%)	20 (4.4%)
11b. My partner wrote or posted content on social media that he or she knew would hurt my feelings.	34 (8.1%)	22 (4.8%)
12a. I used my partner's social media account to view his or her activity without my partner's permission.	101 (23.9%)	75 (16.5%)
12b. My partner used my social media account to view my activity without my permission.	55 (13.0%)	54 (11.9%)
13a. I sent repeated online messages or texts asking about my partner's location or activities.	46 (10.9%)	69 (15.2%)
13b. My partner sent repeated online messages or texts asking about my location or activities.	54 (12.8%)	67 (14.7%)
14a. I used GPS technology to track my partner's location without my partner's permission.	16 (3.8%)	17 (3.7%)
14b. My partner used GPS technology to track my location without my permission.	14 (3.3%)	12 (2.6%)
15a. I took information or images from my partner's phone, e-mail, or social media profile without his or her permission.	30 (7.1%)	27 (5.9%)
15b. My partner took information or images from my phone, e-mail, or social media profile without my permission.	33 (7.8%)	22 (4.8%)
16a. I tried to make my partner talk about sex online when he or she did not want to.	30 (7.1%)	14 (3.1%)
16b. My partner tried to make me talk about sex online when I did not want to.	33 (7.8%)	26 (5.7%)
17a. I intentionally ignored my partner's phone calls or text messages to hurt my partner's feelings.	19 (4.5%)	135 (29.7%)
17b. My partner intentionally ignored my phone calls or text messages in order to hurt my feelings.	18 (4.3%)	125 (27.5%)

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