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The measurement, intensity and determinants of fear of cybercrime: A systematic review

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ABSTRACT

It has only been recently that fear of crime scholars have shifted their attention to online contexts. The current systematic review provides an overview of available studies on measurement, intensity and determinants of fear of cybercrime. While matters of measurement and conceptualisation has sprung a sizeable and vivid debate in the general fear of crime literature, we aim to scope this debate for the online context by scrutinizing the available knowledge base. At the same time, and by providing an overview of correlates of fear of cybercrime, we aim to provide a fertile ground for theory building specific to the online context. A comprehensive literature search was conducted, yielding a total of 28 relevant studies from a range of (sub)disciplines, using a variety of measures in terms of the particular emotion measured (fear, worry, anxiety) and the type of cybercrime it related to. We find considerable agreement between studies on classic fear of crime indicators such as gender, victimization and risk perception. At the same time, various studies report a relationship between fear of cybercrime and what is termed 'constrained behavior', as outcome measure. Implications of these findings, and future directions for fear of cybercrime research are discussed.

1. Introduction

Challenges related to the growth of the Internet have become an indispensable part of academic, political, media and general discourse (Wall, 2001, 2008; Yar, 2011), including challenges related to crime in online environments. Even though the Internet (also) has many positive impacts on its users' everyday lives (Yar, 2011, 2013), the enabling effect the Internet has on a variety of previously already existing crimes, as well as on the invention of entirely new criminal acts, is by now well recognized and described (Brenner, 2004; Grabosky, 2001; Jewkes and Yar, 2011; Wall, 2017). This is also reflected in the increasing number of studies taking interest in cybercrime, including studies that investigate cybercrime victimization (Holt, 2003; Holt and Bossler, 2014; Näsi et al., 2015; Reep-van den Bergh and Junger, 2018).

Despite the substantial (academic) attention drawn to cybercrime and cybercrime victimization, studies investigating emotional experiences related to (the threat of) cybercrime victimization have been more scarce (but see for instance: Cross et al., 2016; Jansen and Leukfeldt, 2018). More specific to the aim of the current study, it has been only fairly recently that *fear of crime* scholars - or those interested in fears and worries related to the threat of crime victimization more generally - have started catching up with studying the fears and worries people may experience specifically relating to (the threat of) cybercrime victimization. This may be somewhat surprising as a substantial literature in the field of criminology has developed, debated and investigated the *fear of crime* in general (Farrall, Jackson and Gray, 2012; Hale, 1996; Lee and Mythen, 2017). It has nonetheless been suggested that this newly developing field of study would benefit from a clear overview with respect to *"whether and why individuals experience fear of online crime"* (Henson, Reyns and Fisher, 2013: 476). In response to this, the current contribution systematically reviews the current state of fear of crime scholarship in online environments. More specifically, we seek to further the fear of cybercrime literature by (1) reviewing the ways the construct fear of cybercrime is measured, against the background of knowledge produced in the general fear of crime literatures, (2) in order to make more rigorous claims about the degree individuals experience fear of cybercrime, and (3) what explanations for the experience of fear of cybercrime are offered.

Systematically reviewing the available literature on these aspects we consider relevant for various reasons in particular. First, a preliminary appraisal of studies available on fear of cybercrime suggests the research base is somewhat fragmented. Differences in terms of measurement and

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conceptualisation of fear of cybercrime (again, also a heavily debated topic in the general fear of crime literature), is likely to play an important part in this. After all, *"[t]he measurement of fear of crime directly affects its estimates of its prevalence, frequency, and intensity"* (Henson, Reyns and Fisher, 2013: 477). Relatedly, it can also be noted that the type of cybercrime investigated tends to vary substantially between studies. Some studies tend to focus on the degree to which people are fearful of a particular cybercrime, whereas others merge a range of cybercrimes into a general 'fear of cybercrime' measure. Finally, a variety of predictors are introduced, theorized, and modelled in different studies in order to explain fear of cybercrime, whereas in other studies fear of cybercrime is mobilized as predictor itself. It follows from the above that it is not entirely clear if and how fear and worries about (particular types of) cybercrime are related to a variety of key predictors proffered in studies. Equipping the field of study with a systematic review of the measurement, conceptualisation, and determinants of fear of cybercrime may assist in providing a better understanding of its correlates, observe if/why studies may (possibly) report overlapping (and contrasting) findings, and serve as a directive for future studies interested in further exploring fear of cybercrime.

This systematic review will proceed with a short discussion of the phenomenon 'cybercrime'. This is followed by a short review of lessons learned - in most part, drawing on the general fear of crime literatures - in terms of measurement and conceptualisation of the fear of crime. These short reviews were imperative to the design of our search strategy, which is detailed in the method section. Following our exploration of indicators related to the fear of cybercrime, in the discussion we will reflect on the theoretical perspectives, put forward in the included studies and more generally as part of the general fear of crime literature, as explanations for reported fear of cybercrime.

2. Cybercrime

Despite the common use of the term 'cybercrime', there has been considerable debate about what it actually 'is' and how to define it (Brenner, 2004; Gordon and Ford, 2006; Holt and Bossler, 2014). Gordon and Ford (2006) have defined cybercrime as broadly as *"any crime that is facilitated or committed using a computer, network, or hardware device"* (14), whereas Wall (2001) argued that *"the term 'cybercrime' does not actually do much more than signify the occurrence of a harmful behavior that is somehow related to a computer"* (2).

Meanwhile, much progress has been made in providing a common language to refer to the cybercrime problem, even though conceptualisation and classification is sometimes still presented as an ongoing project part of the fields' research agenda (Ngo and Jaishankar, 2017). For the purposes of the current study we follow Wall (2007; 2017), who differentiates between *'cyber-assisted'*, *'cyber-enabled'* and *'cyber-dependent'* crimes (533), which differ in terms of their 'relationship to a computer'. One can understand their differences by using Walls' 'transformation test': imagining what would happen with the crime in question if the internet would be taken away. Doing so also provides a way of understanding how *"crimes have been transformed in terms of their mediation by technologies"* (Wall, 2017: 533). If the internet would disappear, so would cyber-dependent crimes (such as DDoS attacks, or piracy), according to Wall. Cyber-assisted crimes, which *"use the internet in their organization"* (533), would yet remain (for instance, looking up on the internet how to commit a crime). In between these extremes, cyber-enabled crimes (many frauds and deceptions) would still remain, but their reach or scale would be reduced towards a more *"localized level"* (533).

3. The fear of (cyber)crime

Studies reporting on the fear of crime in general indicate that the field has struggled with the conceptualisation and measurement of the phenomenon, resulting in both being extensively debated aspects part of the broader fear of crime literature (Farrall, Jackson and Gray, 2012; Ferraro, 1995; Ferraro and LaGrange, 1987; Garofalo, 1981; Hale, 1996; Hinkle, 2015; Lee, Jackson and Ellis, 2020). Early studies tended to rely on the use of (a variation of) the perceived safety measure (*'How safe do you feel or would you feel being out alone in your neighbourhood at night'*) (Hinkle, 2015: 150) in order to measure fear of crime, but this type of question has received substantial critique over time. Importantly, it is by now generally agreed upon that crime should be mentioned part of questions used to investigate the fear of crime (Farrall, Jackson and Gray, 2012; Gray, Jackson and Farrall, 2011). Studies have also pointed at the downsides of using a generalized crime measure (Ferraro and LaGrange, 1987; Rader, 2017). That is, asking how fearful or worried a person is about crime in general, instead of a more specific type of crime. It could be argued that these practices are also relevant to the study of fear of crime in online contexts, also taking into consideration the different types of cybercrime as introduced in the previous section.

Another disadvantage of the use of the perceived safety measure is that feelings/emotions (fear) and thoughts/cognitions (risk perceptions) become conflated. Indeed, scholars tend to agree that *"fear of crime involves feelings, thoughts, and behaviours, all of which are focused on the subjectively conceived threat of criminal victimization"* (Jackson and Gouseti, 2013: 2). It is at the same time generally accepted that, while perceptions of risk and emotions related to the threat of criminal victimization are related, they are not interchangeable phenomena (Hicks and Brown, 2013; Rader, 2004; Rader et al., 2007; Warr, 2000). The same can be said of behaviours related to the subjectively conceived threat of criminal victimization (Rader, 2004; Rader et al., 2007). Arguably, drawing such distinctions is equally relevant when studying the fear of cybercrime. As it is our aim to study the *emotional* dimension to the subjectively conceived threat of criminal victimization, we shall critically scrutinize whether the measure of fear in the included studies taps into this emotional dimension.

At the same time, there has been considerable debate about the exact wording used to study emotions related to the threat of criminal victimization. Following Jackson and Gouseti 2013, these *"include rare physical responses to immediate threat ("fear"), a more general patterning of repetitive thoughts about future uncertain harm ("worry"), and an even more widespread but diffuse low-level emotion ("anxiety") quite separate from concrete feelings of imminent danger"* (2). Jackson and Gouseti mention that when people are asked - in an interview or survey - about their fears (and worries) about falling victim to a particular type of crime, typically responses tend to be distant and future orientated, rather than referring to direct fears related to an immediate threat unfolding in (cyber)space and time. Indeed, such questions asked could in fact elicit mental images of crime and victimization, independent of the fact if respondents are confronted with such situations in their everyday lives (Lee, Jackson and Ellis, 2020). Rather then, the language of *fear* and *worry* seems to be used in such occasions to express more *"widespread but diffuse low-level"* emotions, labelled above as anxiety by Jackson and Gouseti (2013; 2). From this, we take that both wording and measurement combined are imperative to the study of specific affects and emotions related to the subjectively conceived threat of criminal victimization. In this systematic review, we will use the term *fear of (cyber)crime* as general umbrella concept, including these different emotions mentioned above, but excluding risk perceptions and behaviors related to the subjectively conceived threat of criminal victimization.

4. Method

4.1. Search strategy

Following substantial preparations, a literature search was conducted on the twenty-first of April 2020. To be able to include the most recent work published after completing a first version of our manuscript, we again did a search on July 15, 2021. Having conversed our research question with two University librarians who specialize in (providing

support in) performing systematic reviewing in online databases, the following electronic journal databases were selected as relevant to the current research question, as well as available through our University's licence: ACM, DBLP, EBSCOhost (including APA PsycInfo, Communication & Mass Media Complete, Criminal Justice Abstracts, ERIC, MEDLINE, APA PsycARTICLES, and Psychology and Behavioral Sciences Collection), Google Scholar, ProQuest (Sociological abstracts), PubMed, and Web of Science.

We developed a search string to include articles taking interest in 1) 'fear of crime' in 2) 'online environments'. Two strategies were used to identify concepts related to 'fear of crime', in order to broaden our search result. The first consisted of reviewing the search terms used in a number of systematic reviews on fear of crime in offline environments (Collins, 2016; Gill et al., 2014; Lorenc et al., 2013a; Lorenc et al., 2013b; Sreetheran & Van Den Bosch, 2014). The selection of search terms drawn from these were then checked - and supplemented - with leading handbooks and publications on the conceptualisation and measurement of fear of crime (Farrall, Jackson and Gray, 2012; Ferraro, 1995; Ferraro and LaGrange, 1987; Garofalo, 1981; Gray, Jackson and Farrall, 2011; Hale, 1996; Lee and Mythen, 2017). The literatures also signalled that both the terms *crime* and *victimization*[1] are used as objects of fear, worry and/or anxiety. In selecting words and phrases related to 'online environments', we acquainted ourselves with terms frequently used in studies focusing on crime victimization in online environments: *online, on-line, cyber, Internet* and *digital* we included in our search query. Finally, it appeared to be fairly common to use the integrated (both object and context of 'fear') term cybercrime, which then was also included in our search string. Integrating the previous, resulted in the following search string, used to identify relevant studies in the selected electronic journal databases:

(((fear OR worry OR anxiety) AND (crime OR victimi?ation) AND (online OR on-line OR cyber OR Internet OR digital)) OR ((fear OR worry OR anxiety) AND (cybercrime)))

Using this search string, our first search yielded a total number of 2507 studies and our second search a total of 1455 studies, including doubles *between* the databases. Being quite aware of the universality of our search string, we substantiate our approach in reference to our aim as detailed in the introduction. Indeed, we designed our search string to capture the widest range of potentially relevant studies, making sure not to exclude studies on the basis of pre-determined conceptualisations.

4.2. Study selection

To be included in the current review (1) a study needed to investigate fear, worry or anxiety[2] as emotional response to (the threat of) criminal victimization (2) in relation to online environments. Studies that focus on both online and offline environments were also included. (3) Studies that specify particular crimes as object of fear, and studies that use a general, single, composite or cumulative fear of cybercrime measure, were included. As we focus on crime (punishable by law), studies (solely) taking interest in cyberbullying were excluded from the current review. For practical reasons, from this point onwards we will refer to the plethora of possible intersections between (different) emotions and (different) cybercrimes as *'fear of cybercrime'*. (4) To be included, studies also needed to explain how fear of cybercrime was measured. (5) In order to make a direct comparison between studies more straightforward, we chose to focus exclusively on quantitative studies. (6) Both studies positioning fear of cybercrime as dependent and/or independent variable were included. (7) Even though the current study aims to systematically review attributes that evoke or reduce fear of cybercrime, we choose not to systematically exclude studies that lack this information. While studies lacking this information are less conducive to our overall aims, they can still provide information about measurement and conceptualisation of fear of crime in the literatures focusing on online environments. (8) Finally, studies needed to be published in an academic *peer reviewed* journal, written in English.

Both authors participated in the study selection procedure. The titles and abstracts of all 3962 (search 1: 2507 (S1) + search 2: 1455 (S2)) studies, acquired through the reported search strategy, were read. Independently, and in separate files, both authors labelled individual studies as 'potentially include', 'exclude', or 'in doubt'. The authors reached an initial overall agreement rate of 97,5% for the first search (S1) and 98.1% for search two (S2). Studies of which the labels differed were discussed to reach an informed decision. After this stage, 40 (S1: 31 + S2: 9) studies were labelled as *'potentially include'*, yet including three doubles between our first and second search rendering a total of 37 unique studies. 41 (S1: 32 + S2: 9) unique studies were labelled as *'in doubt'*, whereas the remainder of the studies were excluded. After scanning the full texts of the studies labelled *'in doubt'*, 4 (S1: 2 + S2: 2) studies were re-labelled as 'potentially include'. The other 37 studies, initially labelled *'in doubt'* were excluded. This resulted in a total of 41 potentially relevant studies for inclusion in this systematic review.

4.3. Data extraction and quality assessment

The data extraction and quality assessment was the final step in setting the definitive number of studies to be included in this systematic review. A standardized data extraction form was used to scrutinize the studies on a more granular level, against the background of the inclusion criteria, and to extract relevant information from the studies for our analysis. Again, this stage was conducted by the two authors separately, using the same labelling strategy described above. This second step in the selection procedure resulted in the exclusion of 14 (S1: 11 + S2: 3) studies, making a total of 27 included studies. As a final step in our search for potentially relevant studies, the reference lists of these 27 studies were checked for additional relevant studies. This resulted in the inclusion of 1 (S1: 1 + S2: 0) additional study, setting the total number of included studies for this review to n = 28. We take the results of this check of the included studies' reference lists as an indicator that our search query has rendered an acceptable result: while only one additional study was identified this way, a fair number of studies featured in our dataset, that were yet absent in the reference lists of the included studies. The flow of the data selection is schematically displayed in Fig. 1.

The data extraction form was also used to assess the quality of the studies, using a number of pre-determined criteria based on the Cambridge Quality Checklist (see Jolliffe et al., 2012). For each study, 1) the sampling method, 2) response rate, 3) sample size, and 4) the measurement of the correlate(s) was considered. Studies awarded 4 points were classified as highest quality, based on these criteria. Studies awarded 0 points were classified as lowest quality, based on these criteria. For the sampling method, studies with random sampling or total population sampling were awarded 1 point. Studies using convenience sampling (e.g. students sample) or a case-control were awarded 0 points. Studies with response and retention rates of ≥70% and differential

[1] To be noted is that various studies also refer to fear/worry/anxiety of violence. The term 'violence' was intentionally left out from out search string, taking into consideration the online context in which victims and offenders are often more distant to one another and violent encounters are more rare. One can yet debate if this might have negatively influenced our results, as the term is somewhat overlapping with the 'cyber-violence' category distinguished by Wall (2001). It was our judgment that the other search terms would be inclusive *enough* to also capture studies interested in those particular types of cybercrime.

[2] We look at anxiety as a widespread but diffuse low-level emotional response related to the problem or threat of (cyber)crime victimization, not as a (general) trait or a mental health related variable. Two studies used 'concern' about cybercrime part of their measure. While we originally did not include 'concern' as part of our search string, as we estimated it to cause considerable noise in our (already quite wide-ranging) search results, we did include these two studies as their contents fit the overall aim of our review.

attrition of ≤10% were awarded 1 point; otherwise, studies were awarded 0 points. Studies using sample sizes of ≥400 were awarded 1 point, whereas sample sizes <400 were awarded 0 points. Finally, for the measurement of the correlate(s), studies with a reliability coefficient ≥0.75 and reasonable face validity, or those with criterion or convergent validity coefficient of ≥ 0.3, or when more than one instrument or information source was used to assess the correlate/out-come of interest, are awarded 1 point. Studies with none of the aforementioned (e.g. single item measure) are awarded 0 points. When studies do not provide information on the aspects described previously, 0 points were awarded. The quality assessment is used in our analysis and results as a means to explain possible differences in results between studies.

4.4. Analytical approach

Our analysis, and reporting of results proceeds in three steps. In a first step, the characteristics of the included studies, the method used, the sample characteristics and the quality of the studies are presented. In the second step, we report the conceptualisation and measurement used to examine the fear of cybercrime, the intensity with which fear is experienced, including the 'object' of fear (general fear of cybercrime and/or a particular cybercrime). In a final step, indicators reported in the individual studies are merged in categories under which they are synthesized narratively. This is done separately for studies that have used fear of cybercrime as an antecedent measure, and studies that have used fear of crime as an outcome measure.

5. Results

5.1. Characteristics of the studies

From Table 1, it first follows that studies originate from a variety of contexts: six studies originate from the USA (11, 12, 13, 14, 19, 28), whereas three studies draw on a comparison between- or combine samples from the USA and another country (China, Canada, Korea) (5, 9, 10). European countries are also well represented, with three studies originating from Finland (20, 23, 25), two from Portugal (21, 22) and the Netherlands (4, 8), and one each from Italy (3), Belgium (7), Germany (15), and Slovenia (16). Virtanen (2017 (26)), in turn, draws on a European sample. The studies by Maddison and Jeske (2014 (18)) and Akdemir (2021 (2)) draw on a UK sample. Finally, two studies originate from South Korea (6, 17), and one each from Australia (24) and Canada (1).

Most studies tend to sample among the general population of the country, or a select segment of the general population (for instance, students or adolescents). Three studies draw from the MTURK panel (9, 11, 12), whereas three have sampled using Facebook(groups) (18, 23, 28). It is also important to note that various studies have restricted their sample to cybercrime *victims* (3, 7, 12, 19, 20).

Also the quality of the included studies differed: Based on the criteria used in this study, four studies are assessed to be of highest quality (score: 4), seven high quality (score: 3). Only one study was assessed lowest quality (score: 0), whereas four studies score low (score: 1). Most studies, twelve in total, are of medium quality (score: 2).

5.2. Measurement and intensity of fear of cybercrime

The studies differed in terms of how they approached and measured fear of cybercrime (Table 2). Eleven studies exclusively measured the emotion fear (1, 3, 6, 7, 12, 13, 14, 17, 18, 21, 22). Five studies exclusively measured worry (2, 20, 23, 24, 25), whereas two referred to concern (26, 27). The remainder of the studies combined two or more emotions, also including anxiety. Only one of these included multiple emotions in a single question (9), whereas the other studies that took interest in measuring multiple emotions, used multiple questions to address different emotions.

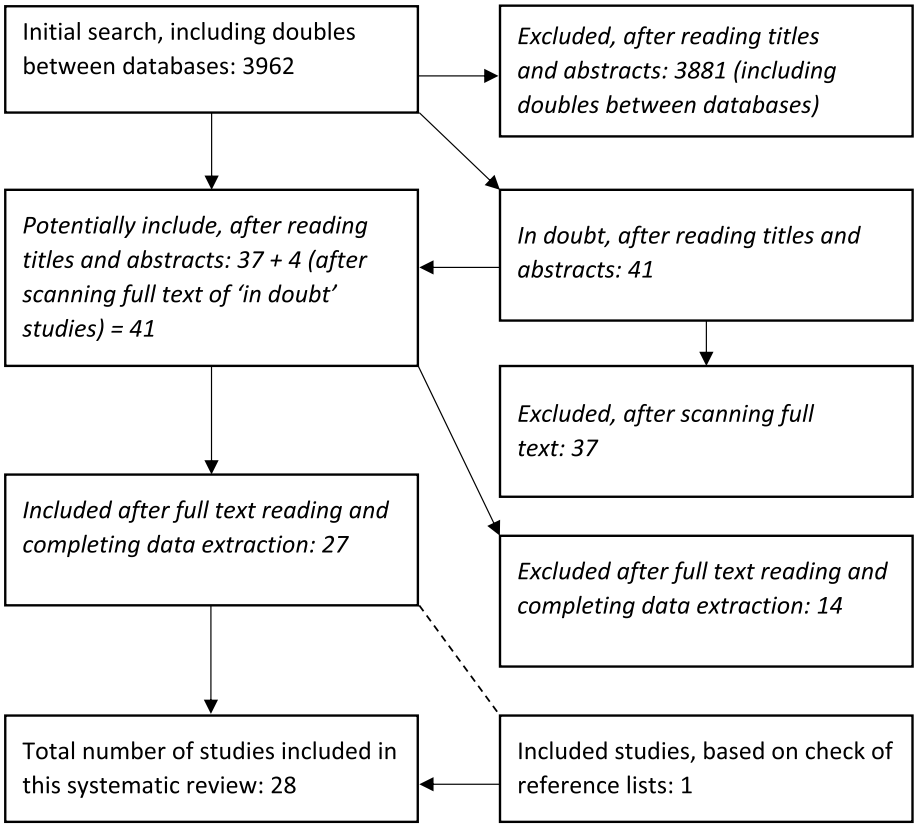

Fig. 1. Flowchart of literature search and selection process.

Table 1
Characteristics of the included studies.

Study number for in text reference	Authors (publication year).	Country	Study characteristics	Type of study	Study quality (Cambridge Quality Checklist)
1	Abdulai (2020)	Canada.	462 students from the University of Saskatchewan (89.8% female; M_{age} = not reported).	Survey study	2
2	Akdemir (2021)	UK.	35000 adults who live in England and Wales (% female not reported; M_{age} = not reported)	Survey study	2
3	Begotti and Maran (2019)	Italy.	111 cyberstalking victims in a sample of Italian University Students (61% female; M_{age} = 22.7).	Survey study	0
4	Brands and Van Wilsem (2021)	The Netherlands.	4761 participants from the Dutch population (53.3% female; M_{age} = 50.53).	Survey study	4
5	Chen and Zahedi (2016)	USA & China.	480 participants from the USA (53.8% female; M_{age} = 34.1) and 238 participants from China (26.1% female; M_{age} = 25.2).	Survey study	2
6	Choi et al. (2021)	South Korea.	10671 persons, 14 years or older, from South Korea (52.1% female; M_{age} = 44.31)	Survey study	3
7	De Kimpe et al. (2020)	Belgium.	334 cybercrime victims from the city of Ghent, Belgium (45.5% female; M_{age} = 43.47)	Survey study	3
8	Van de Weijer, Leukfeldt and Van der Zee (2020)	The Netherlands.	A sample of 595 Dutch-speaking citizens, aged 18 years or older, drawn from a panel representative of the general Dutch population (43.2% female; M_{age} = not reported)	Survey study	4
9	Elhai and Hall (2016)	USA & Canada.	304 participants on Amazon's Mechanical Turk (Mturk) system (44.4% female; M_{age} = 32.61)	Survey study	2
10	Elhai et al. (2017)	USA & Korea.	389 American students (73.7% female; M_{age} = 19.68) and 216 Korean students (66.0% female; M_{age} = 25.04)	Survey study	2
11	Elhai, Levine and Hall (2017)	USA.	304 participants on Amazon's Mechanical Turk (Mturk) system (39.8% female; M_{age} = 33.05)	Survey study	2
12	Fissel (2021)	USA.	1500 respondents on Amazon's Mechanical Turk (Mturk) system, that speak English, reside in the USA and are aged 18–25. The study uses a subsample of 576 cyberstalking victims (67.53% female; M_{age} = 22.83).	Survey study	3
13	Henson, Reyns and Fisher (2013)	USA.	838 students from a large, urban university in the Midwest (61% female; M_{age} = 20.17)	Survey study	2
14	Higgins, Ricketts and Vegh (2008).	USA.	224 undergraduate students from a Southeastern university (49.1% female; M_{age} = not reported)	Survey study	2
15	Hille, Walsh and Cleveland (2015, Study 3)	Germany.	1150 participants from the German population (45% female; M_{age} = 38.3)	Survey study	4
16	Jordan, Leskovar and Maric (2018)	Slovenia.	190 participants from the Slovenian population (48.4% female; M_{age} = 29.7)	Survey study	1
17	Lee et al. (2019)	South-Korea.	486 students enrolled in several urban universities located in South Korea (43.6% female; M_{age} = 21.7)	Survey study	2
18	Maddison and Jeske (2014)	UK.	159 participants on Facebook (67.3% female; M_{age} = 21.12)	Survey study	2
19	Nobles et al. (2014).	USA.	1533 participants from the American population. This study compares two groups of stalking victims: (1) victims of stalking who did not experience cyberstalking (n = 1237; 67.3% female; M_{age} = 40.84) and (2) victims of stalking who also experienced cyberstalking (n = 296; 58.45% female; M_{age} = 38.38)	Survey study	3
20	Oksanen and Keipi (2013)	Finland.	46139 Finnish and Swedish speaking participants from the Finnish population (55.2% female; M_{age} = not reported).	Survey study	2
21	Pereira and Matos (2016)	Portugal.	627 adolescents from Portugal (54.9% female; M_{age} = 13.98), of which 61.9% were cyberstalking victims which is the subsample of interest for the current study (52.5% female; M_{age} = 14.26)	Survey study	3
22	Pereira, Spitzberg and Matos (2016)	Portugal.	627 adolescents from Portugal (54.9% female; M_{age} = 13.98), of which 60.8% were repeated victims which is the subsample of interest for the current study (57,2% female; M_{age} = 14.20)	Survey study	4
23	Räsänen et al. (2016)	Finland.	723 participants on Facebook (65.1% female; M_{age} = 16.6)	Survey study	2
24	Roberts, Indermaur and Spiranovic (2013)	Australia.	1550 participants from the Australian population (50% female; M_{age} = 47)	Survey study	3
25	Savimäki et al. (2020)	Finland.	1092 witnesses of online hate (63.1% female; M_{age} = 20.69)	Survey study	1
26	Virtanen (2017)	Europe.	18711 participants from the European population (49.9% female; M_{age} = 39.65)	Survey study	3
27	Vozmediano et al. (2013)	Not reported.	50 Criminology students (80% female; M_{age} = 20.39)	Survey study	1
28	Yu (2018)	USA.	153 participants from Amazon's Facebook page (68.6% female; M_{age} = 33.67)	Survey study	1

Research participants were also asked about their worries, concerns, anxiety and fears related to a wide variety of cybercrimes, both specific or in general. Seven studies used a single item, in order to measure a specific emotion about a particular type of cybercrime (1, 2, 6, 12, 20, 23, 25). Most studies, however, used a composite score based on a number of items. Sometimes, these items consisted of questions asking about respondents' emotional experiences (see above, fear, worry, concern and/or anxiety), related to the possibility of falling victim to a *particular* cybercrime (see, for instance Chen & Zahedi, 2016 (5)). But, more often, these composite measures were constructed from questions asking about emotions (either single, or multiple) related to the possibility of falling victim to range of different cybercrimes. These cybercrimes included various aspects related to cyberstalking, online harassment or being threatened online, receiving malicious software, ransomware, hacking, phishing, identity theft, consumer fraud, data breaches, online property damage, and being targeted for hateful or degrading material online. From this, we see that cyber-assisted, cyber-enabled, and cyber-dependent crimes (Wall, 2007) are investigated in studies interested in fear of cybercrime.

Investigating the intensity with which fear of cybercrime is experienced, we see substantial differences between the studies. Such differences should come as no surprise taking into consideration the variety of emotions and cybercrimes included in the studies, and outlined in Table 2. While there is therefore little use in making direct comparisons, generally speaking, many studies seem to score around the midpoints of the scales they implemented to measure fear of cybercrime, whereas some studies report substantially lower scores.

5.3. Antecedent measures of fear of cybercrime

We proceed our analysis by merging attributes reported in the individual studies into categories, which are synthesized narratively below. The synthesis is supported by a summary of included attributes in Tables 3 and 4. Fear of cybercrime[3] was both used as independent and outcome variable in the included studies. Below, we will start with describing studies that measure fear of cybercrime as an outcome, followed by describing studies that measure fear of cybercrime as a predictor. In doing so, we always build on the results drawn from the most complete (full) model.

5.3.1. Demographics: gender, age, education, income, social status, employment status, race, relationship status, culture and location of residence

Ten out of fifteen (4, 6, 7, 10, 13, 17, 18, 21, 22, 26) studies report a significant positive relationship between gender and fear of cybercrime, even though the characteristics of the studies, the way fear of cybercrime is measured, the particular cybercrime surveyed, and study quality differ substantially. In all these studies women report greater fear of cybercrime as compared to men. The other five studies that included gender in their models report a non-significant relationship (1, 2, 9, 12, 24). Quality scores (2 and 3 respectively) do not deviate from those studies mentioned above. In contrast to the studies that report a significant relationship with gender, Elhai and Hall (2016 (9)) focus quite specifically on *data breach anxiety*. More generally, many predictors used in this study do not reach significance. The other four studies do not focus on a distinguished type of crime.

Many studies also included age as an antecedent of fear of cybercrime. Results are much more mixed as compared to gender. Five studies (2, 4, 7, 17, 24) report a positive relationship, meaning that older respondents report higher fear of cybercrime. However, three studies (6, 12, 26) report a negative relationship, indicating older respondents report lower fear of cybercrime, whereas Henson et al. (2013 (13)) are inconclusive about the relationship. The quality scores of all these nine studies range between average and highest. A difference is that Virtanen (2017 (26)) reports on a broader, *European*, sample. At the same time, Virtanen (2017 (26)) differs from other studies by focusing on the emotion concern (as opposed to fear, worry, anxiety or a combination of these, in most other studies). Henson et al. (2013 (13)), in turn, employ a student sample. Similarly, Fissel (2021 (12)) uses a sample with a limited age range. Possibly, lack of diversity in terms of age might have contributed to the contrasting finding (reversal of direction) in these particular studies. Also Pereira, Spitzberg and Matos (2016) sampled among Portuguese adolescents, but they report a non-significant relationship, as do the remaining three studies (1, 9, 10).

Eight studies included the level of education as predictor of fear of cybercrime. Five report a non-significant relationship (1, 7, 9, 18, 24). Two studies (2, 6) report a positive relationship, while Brands and Van Wilsem (2021 (4)) report a negative relationship. In their study, higher educated respondents report lower *fear of online financial crime*. All these studies have average to highest quality, suggesting this is unlikely to cause this contrasting finding. What the studies reporting a positive relationship share is that they build on data from a national victim survey, from England and Wales and South-Korea, respectively. At the same time, also Brands and Van Wilsem draw on a representative sample from the Dutch population. While Pereira, Spitzberg, and Matos (2016) do not report on the level of education, they do find a positive association between receiving education on a public school (as opposed to a private school) and *fear following cyber-harassment victimization*.

Income is included as an antecedent of fear of cybercrime in six studies. Four studies (1, 4, 9, 24) report a non-significant relationship. The same studies (2, 6) that reported a positive effect for education (above) also report a positive effect for income.

Finally, Virtanen (2017 (26)) reports that lower (self-reported) social status predicts *fear of cybercrime*. Elhai et al. (2017 (10)) report an effect of culture: their Korean respondents reported greater *hacking anxiety* as compared to their US respondents. Elhai and Hall (2016 (9)) report a non-significant relationship between employment status and *data breach anxiety*, whereas Choi et al. (2021 (6)) report a positive significant relationship between employment status and *fear of identity theft victimization*. Three studies (1, 12, 13) report a non-significant relationship for race. The same is true for two (1, 13) out of three studies investigating relationship status. Choi et al. (2021 (6)) report a positive relationship between relationship status and *fear of identity theft victimization*. Finally, Roberts et al. (2013 (24)) report no significant differences in *fear of cyber-identity theft and related fraudulent activity* for people living in metropolitan as compared to non-metropolitan areas.

5.3.2. Victimization

In total, nine studies included victimization as an antecedent of fear of cybercrime. Seven of these studies (1, 4, 6, 10, 11, 17, 26) report a positive significant relationship, meaning that crime victims report greater fear of cybercrime. The quality of these studies ranges from average to highest. One study reports a non-significant relationship (9). As mentioned above, this study generated many non-significant results more generally. The study by Henson et al. (2013 (13)) is inconclusive, reporting one positive, two negative and six non-significant relationships, depending on the type of victimization and victim-offender relationship. To be noted is that this study differentiates between direct, first hand, victimization (as in the other studies) and indirect, second hand, victimization. It is on the indirect victimization variable that the negative associations are reported.

Whereas many studies have drawn their samples from a wider audience including both online crime victims and non-victims, six studies (3, 7, 12, 19, 21, 22) explicitly focus on victims of cybercrime. All differentiate after *type* of online victimization. Begotti and Maran (2019

[3] In our results below we will use fear of cybercrime as an inclusive 'umbrella' term, when we aim to refer to a collection of studies, including different emotions and types of cybercrime. When we refer to individual studies, we will use the original wording as used by the authors in that specific study (see fourth column of Table 2) and, for the sake of further clarity, use italics.

Table 2
Measurement and reported intensity of fear of cybercrime in the included studies.

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
1	Abdulai (2020)	Respondents were asked if "during the past month, they had ever felt **fearful** about being the victim of credit/debit card fraud"	Emotions(s): fear. Cybercrimes: single, specific cybercrime. Outcome: single emotion and specific cybercrime into a single measure: **fear of credit/debit card fraud victimization (yes/no).**	35.5% of the respondents had felt fearful about being the victim of credit/debit card fraud during the past month. 64.4% of the respondents had not felt fearful about being the victim of credit/debit card fraud during the past month.
2	Akdemir (2021)	Respondents were asked: "How **worried** are you about being a victim of online crime". Responses were measured on a four point scale (very worried to not at all worried), but were recoded into a dichotomous variable (worried/not worried)	Emotions(s): worry. Cybercrimes: single, cybercrime in general. Outcome: single emotion and single cybercrime measure: **fear of cybercrime.**	43.50% of the respondents were (very) worried about being a victim of online crime. 56.50% of the respondents were not (very or not at all) worried about being a victim of online crime.
3	Begotti and Maran (2019)	Respondents were asked to report "various consequences connected to the their cyberstalking experience" [Online contact/ Online harassment/Unwanted sexual advances online/Online threats of violence/ Online identity fraud]. **Fear** was one of the 10 items that investigated the emotional consequences. Respondents could answer they experienced fear as a consequence (yes), or not (no).	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **fear following cyberstalking victimization (yes/no).**	26.8% of the respondents who experienced one type of cyberstalking reported fear following cyberstalking victimization. 44.1% of the respondents who experienced multiple types of cyberstalking reported fear following cyberstalking victimization.
4	Brands and Van Wilsem (2021)	For four specific cybercrimes, respondents were asked to what degree they were afraid or worried becoming a victim of this cybercrime type, on a 5-point scale (from 1, strongly disagree to 5, strongly agree). - I am **afraid** that [the things I buy over the Internet will not be delivered to me/ someone will break into my computer]. - I **worry** that [my credit card number will become available to others via the Internet/ through online banking my banking credentials will become available to others]. The scores for each cybercrime were combined into a single fear of cybercrime scale (Cronbach's $\alpha = 0.79$).	Emotion(s): fear and worry combined. Cybercrimes: various, specific cybercrimes. Outcome: different emotions and different cybercrimes combined into a single measure: **fear of online financial crime.**	Fear of online financial crime: 2.88. Out of a possible 1–5.
5	Chen and Zahedi (2016)	Respondents were asked to respond to the statements: When it comes to my feelings and concerns about Internet security attacks, I believe that [my **fear** of exposure to Internet security attacks is (1, very low to 10, very high)/the extent of my **worry** about Internet security attacks is (1, very low to 10, very high)/the extent of my **anxiety** about potential loss due to Internet security attacks is (1, very low to 10, very high)] The authors name this variable 'Perceived security threat' (Cronbach's $\alpha = 0.95$ for USA sample and 0.88 for China sample).	Emotion(s): fear, worry and anxiety combined. Cybercrimes: single, specific cybercrime. Outcome: different emotions and a single cybercrime combined into a single measure: **perceived security threat.**	Perceived security threat, USA sample: 4.26 Perceived security threat, China sample: 4.95 Out of a possible 1–10.
6	Choi et al. (2021)	Using a single-item indicator, respondents were asked how **fearful** they were of "possible theft and misuse of their resident registration numbers (RRNs)". Response options ranged from 1 = not at all to 5 = very much.	Emotions(s): fear. Cybercrimes: single, specific cybercrime. Outcome: single emotion and specific cybercrime into a single measure: **fear of identity theft victimization.**	Fear of identity theft victimization: 2.95 Out of a possible 1–5.
7	De Kimpe et al. (2020)	For six specific cybercrimes respondents were asked to what degree they were afraid of becoming a victim of this cybercrime type, on a 5-point scale (from 1, disagree to 5, agree). - I am **afraid** to become a victim of [malware/ransomware/hacking/phishing/ identity theft/consumer fraud]. The scores for each cybercrime were combined into a single fear of cybercrime scale (Cronbach's $\alpha = 0.90$).	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **fear of cybercrime.**	Malware: 3.41. Ransomware: 3.17. Hacking. 3.43. Phishing: 3.05. Identity theft: 3.10. Consumer fraud: 3.28. Out of a possible 1–5.
8	Van de Weijer et al. (2020)	Eight items "on which the respondents could answer with a five-point scale ranging from 1 'Totally disagree' to 5 'Totally agree'" were used to measure fear of cybercrime victimization:	Emotions(s): fear and concern combined, plus some items not referring to an emotion. Cybercrimes: various, both cybercrime in general and specific cybercrimes. Outcome: different emotions and different	Not reported.

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Table 2 (*continued*)

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
		1) I am **scared** of becoming a victim of cybercrime in the near future; 2) The idea that someone can log into my online bank account without permission **scares** me; 3) I am **concerned** that I can become a victim of phishing; 4) I am **concerned** about the possibility that my computer can be hacked; 5) I think it can easily happen that I get scammed online; 6) The fact that I can get ransomware on my computer **worries** me; 7) It is quite possible that I will become a victim of cybercrime in the coming year; 8) If I became a victim of **cybercrime**, it could have serious consequences. The scores were combined into a single fear of cybercrime victimization scale (Cronbach's $\alpha = 0.88$).	cybercrimes combined into a single measure: **fear of cybercrime victimization.**	
9	Elhai and Hall (2016)	For ten specific electronic security breach types respondents were asked how worried, anxious or stressed they would feel about the those events potentially happening to them, on a 7-point scale (from 1, not at all to 7, very much): "How **worried, anxious** or stressed do you feel about the following events potentially happening to you?": - IM intercepted. - Email hacked. - Cloud storage account hacked. - Social media account hacked. - Personal information posted by others to the internet. - Sensitive photos posted by others. - Theft of internet account password. - Financial account hacked into. - Computer/phone accessed without permission. - GPS tracking without permission. Using confirmatory factor analysis and exploratory factor analysis, one latent factor was identified.	Emotion(s): worry, anxiety (and stress) combined. Cybercrimes: various, specific cybercrimes. Outcome: different emotions and different cybercrimes combined into a single measure; **data breach anxiety.**	IM intercepted: 2.62. Email hacked: 3.96. Cloud storage account hacked: 3.29. Social media account hacked: 3.50. Personal information posted by others to the internet: 3.62 Sensitive photos posted by others: 3.48. Theft of internet account password: 4.71. Financial account hacked into: 5.35. Computer/phone accessed without permission: 4.47 GPS tracking without permission: 3.95. Out of a possible 1–7.
10	Elhai et al. (2017)	After providing information about recent high profile electronic data hacking incidents featured in the news media, participants were asked "[w]hen thinking about these types of electronic data breaches happening to you, how much are you bothered by the following problems?", on a 5-point scale (from 0, not at all to 4, extremely). Using GAD-7 (a 7-item measure of generalized anxiety and worry), this was specified to: - Feeling nervous, **anxious** or on edge - Not being able to stop or control **worrying** - **Worrying** too much about different things - Trouble relaxing - Being so restless that it is hard to sit still - Becoming easily annoyed or irritable - Feeling **afraid** as if something awful might happen The scores were combined into a two scales, one for the American sample, one for the Korean sample ((Cronbach's $\alpha = 0.90$ for Americans and 0.95 for Koreans).	Emotion(s): fear, worry, anxiety (and nerve, feeling on edge, trouble relaxing, restlessness, annoyed, irritable) combined. Cybercrimes: various, unspecified cybercrimes. Outcome: different emotions and different (unspecific) cybercrimes combined into a single measure: **hacking anxiety.**	Hacking anxiety, American sample: 4.85 Hacking anxiety, Korean sample: 11.00
11	Elhai, Levine, and Hall (2017)	After a brief description was provided about recent electronic data hacking, with news media examples, participants were asked "[w]hen thinking about these types of electronic data breaches happening to you, how much are you bothered by the following problems?", on a 5-point scale (from 0, not at all to 4, extremely). Using GAD-7 (a 7-item measure of generalized anxiety and worry), this was specified to:	Emotion(s): fear, worry, anxiety (and nerve, feeling on edge, trouble relaxing, restlessness, annoyed, irritable) combined. Cybercrimes: various, unspecified cybercrimes. Outcome: different emotions and different (unspecific) cybercrimes combined into a single measure: **hacking anxiety.**	Hacking anxiety: 4.42. Out of a possible 0–28.

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Table 2 (*continued*)

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
		- Feeling nervous, **anxious** or on edge - Not being able to stop or control **worrying** - **Worrying** too much about different things - Trouble relaxing - Being so restless that it is hard to sit still - Becoming easily annoyed or irritable - Feeling **afraid** as if something awful might happen Using confirmatory factor analysis and exploratory factor analysis, one latent factor was identified. Also, a Cronbach's of $\alpha = 0.95$ is reported for the GAD-7 scale.		
12	Fissel (2021)	Respondents were asked "Did you **fear** for your safety or the safety of someone close to you because someone engaged in unwanted contact/behavior?", with response options 0 = no fear, and 1 = fear.	Emotions(s): fear. Cybercrimes: single, specific cybercrime. Outcome: single emotion and specific cybercrime into a single measure: **fear as a result of repeated online pursuit behaviors (yes/no).**	35.24% of the respondents reported fear. 64.76% of the respondents did not report fear.
13	Henson, Reyns and Fisher (2013)	For three online interpersonal victimization (OIPV) forms, respondents were asked "How **afraid** are you that a [current/former intimate partner; friend/acquaintance; stranger] may use the information on your [social network account/other online programs] to [harass/stalk/threaten] you online?", on a 10-point scale (from 0, not afraid at all to 9, very afraid). For each OIPV form a dependent variable was constructed, by calculating the mean of the six [2x specific source; 3x specific crime] survey items. "[T]he Cronbach's alpha statistics ranged from .93 to .95, and the factor loadings ranged from .83 to .90"	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into three single measures: **1) Fear of OIPV by intimate partners, 2) Fear of OIPV by friends/acquaintances, 3) Fear of OIPV by strangers.**	Fear of OIPV by intimate partners: 0.66. Fear of OIPV by friends/acquaintances: 0.57. Fear of OIPV by strangers: 1.17. Out of a possible 0–9.
14	Higgins, Ricketts and Vegh (2008)	A "fear of victimization measure assessed how **afraid** students may be from [insulting/harassing/threatening] messages from three different entities [someone barely known/respondents' friends/significant others] that may have access to the Facebook account". "Overall, the students responded to a total of twelve[a] questions on a four-point scale (from 1, not afraid at all to 4, very afraid). These scores were combined into a single fear of online victimization item (Cronbach's $\alpha = 0.86$), with possible scores ranging from 12 to 48.	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into three single measures: **Fear of online victimization.**	Fear of online victimization: 13.12. Out of a possible 12–48.
15	Hille et al. (2015, Study 3)	Fear of online identity theft (FOIT) is shown to consist of two dimensions: 1) fear of financial losses and 2) fear of reputational damage. Fear of financial losses is measured using 8 items, whereas fear of reputational damage is measured using 3 items, all on a 5-point scale (from 1, strongly disagree to 5, strongly agree): Fear of financial losses: - I am **afraid** that somebody could steal my money while I am transferring my personal data online. - I am **scared** that a criminal could use my bank account number to do online shopping in my name. - I am **scared** that a criminal could use my credit card account number to do online shopping in my name. - I am **frightened** that somebody could do online shopping at my expense. - I am **worried** about an unauthorized person making online purchases using my personal data. - I am **scared** that when I have to give my credit card number to shop online that it could be misused. - I am **scared** that when I have to give my bank account number to shop online that it	Emotion(s): fear and worry combined. Cybercrimes: various, specific cybercrimes. Outcome: different emotions and different cybercrimes combined into two single measures: **1) Fear of financial losses, 2) Fear of reputational damage.**	Fear of financial losses: 3.39 Fear of reputational damage: 2.99 Out of a possible 1–5.

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Table 2 (*continued*)

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
		could be misused. - The thought that a stranger could gain access to my customer's account at an online store by using my personal data **frightens** me. These items were combined into a single fear of financial losses item (Cronbach's α = 0.95; CR = 0.95; AVE = .71), with possible scores ranging from 1 to 5. Fear of reputational damage: - I am **frightened** of somebody using my personal data on the Internet in order to run me down. - I am very **worried** that the unauthorized use of my personal data online could damage my reputation. - I am **worried** about my reputation being damaged due to the illegal use of my personal data online. These items were combined into a single fear of financial losses item (Cronbach's α = 0.95; CR = 0.95; AVE = .85), with possible scores ranging from 1 to 5.		
16	Jordan, Leskovar and Maric (2018)	Fear of online identity theft is measured using the same scale as constructed by Hille, Walsh and Cleveland, 2015 (see above). - Fear of financial losses (8 items; Cronbach's α = 0.98). - Fear of reputational damage (4 items; Cronbach's α = 0.94)[b].	Emotion(s): fear and worry combined. Cybercrimes: various, specific cybercrimes. Outcome: different emotions and different cybercrimes combined into two single measures: **1) Fear of financial losses, 2) Fear of reputational damage.**	Fear of financial losses: 2.03 Fear of reputational damage: 1.81 Out of a possible 1–5.
17	Lee et al. (2019)	Respondents were asked how **afraid** they were of being victimized (in general)[c] on the social networking sites (SNS) they are using, on a 5-point (1–5) scale. In addition to this general question, a similar question was also asked regarding five specific types of victimization: - Verbal abuse - Sexual harassment - Privacy infringement - Hacking/malware - Property damage	Emotion(s): fear. Cybercrimes: single, specific cybercrime[c]. Outcome: single emotion and specific cybercrime into a single measure: **Fear of online victimization.**	Fear of victimization (General): 2.270 Fear of victimization (Verbal abuse): 2.310 Fear of victimization (Sexual harassment): 2.230 Fear of victimization (Privacy infringement): 2.840 Fear of victimization (Hacking/malware): 2.670 Fear of victimization (Property damage): 2.390 Out of a possible 1–5.
18	Maddison and Jeske (2014)	Respondents were asked to "Rate your **fear** of" [being a victim of Internet fraud/Online harassment/having you personal Online identity stolen/having your Online property (blogs. Social networking sites etc.) damaged/having your stored data accessed illegally], on a 5-point scale (from 1, not afraid to 5, very afraid): The scores were combined into a single fear of cyber victimization score (Cronbach's α = 0.84).	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **Fear of cyber-victimization.**	Fear of cyber victimization: 2.50. Out of a possible 1–5.
19	Nobles et al. (2014)	Respondents were asked to "indicate whether they felt **frightened**, **scared**, **afraid, panicked, paranoid, threatened, alarmed, hypervigilant, or terrified** when the stalking behaviors began (0 = no to all items and 1 = yes to one or more items), which measured fear at onset. A similar item assessed fear as the behavior progressed (0 = no to all items and 1 = yes to one or more items), which measured fear over time".	Emotion(s): various fear related emotions. Cybercrimes: single, specific cybercrime. Outcome: multiple fear related emotions and a single cybercrime combined into two single measures: **1) Fear at onset, 2) Fear over time.**	Fear at onset: 22.64% indicated yes to one or more items. Fear over time: 13.60% indicated yes to one or more items.
20	Oksanen and Keipi (2013)	Respondents who reported to be victims of cybercrime were asked if "they are **worried** about such things happening again in the next 12 months" (yes/no).	Emotion(s): worry. Cybercrimes: single, cybercrime in general (but exemplified by mentioning fraud and defamation). Outcome: single emotion and single cybercrime measure: **Worry about cybercrime re-victimization (in the next 12 months).**	Number of respondents that does not worry about cybercrime re-victimization in the next 12 months: n = 1421. Number of respondents that does worry about cybercrime re-victimization in the next 12 months: n = 476.
21	Pereira and Matos (2016)	Respondents "who had experienced one or more cyber-stalking behaviors during their lifetime" were asked to rate their degree of	Emotion(s): fear. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different	Most of the victims (57.6%) were not afraid following their cyber-stalking victimization. Of the victims who reported being afraid

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Table 2 (*continued*)

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
		"**fear** as a result of the cyber-victimization", with answer options not afraid, a little afraid, very afraid. Respondents were asked about victimization experiences of the following cyber-stalking behaviors: receiving exaggerated messages of affection; receiving excessively 'needy', disclosive or demanding messages; receiving pornographic or obscene pictures or messages; receiving sexually harassing messages; obtaining someone's private information without permission; using the victim's computer to obtain information about others.	cybercrimes combined into a single measure: **Fear following cyber-victimization (yes/no).**	(43.4%), 34.3% were moderately afraid (i.e. a little afraid), and 8.1% were very afraid (i.e. very afraid).
22	Pereira, Spitzberg and Matos (2016)	Those who had experienced one or more cyber-harassment behaviors – from a collection of 18 victimization items – in the past were asked to rate the **fear** impact, on a 3-point scale (not frightened, little frightened, very frightened). In case of experiencing more than one episode of victimization, adolescents were instructed to take into account only the most significant cyber-incident of their lives.	Emotion(s): fear. Cybercrimes: single, specific cybercrime. Outcome: single emotion and single cybercrime measure: **Fear following cyber-harassment victimization (yes/no).**	Most of the victims (62.7%) were not afraid following their cyber-harassment victimization.
23	Räsänen et al. (2016)	Respondents were asked to respond to the statement: "I **worry** about being targeted for hateful or degrading material online", with yes/no as answer options.	Emotion(s): worry. Cybercrimes: single, specific cybercrime. Outcome: single emotion and single cybercrime measure: **Worry of victimization (yes/no).**	20.9% of the respondents worried about being targeted for hateful or degrading material online. 79.1% of the respondents did not worry about being targeted for hateful or degrading material online.
24	Roberts, Indermaur and Spiranovic (2013)	On a 4-point scale (from 1, not worried at all to 4, very worried), respondents were asked: "How **worried** are you that the following will occur to you? - Having your identity stolen via the Internet; - Having your credit card details used illegally via the Internet. The scores were combined into a single fear of cyber-identity theft and related fraudulent activity score (Cronbach's $\alpha = 0.86$).	Emotion(s): worry. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **Fear of cyber-identity theft and related fraudulent activity.**	Fear of cyber-identity theft and related fraudulent activity: 4.97 Out of a possible 2–8.
25	Savimäki et al. (2020)	Respondents were asked to respond to the statement: "I **worry** about being targeted for hateful or degrading material online", with yes/no as answer options.	Emotion(s): worry. Cybercrimes: single, specific cybercrime. Outcome: single emotion and single cybercrime measure: **Worry of victimization (yes/no).**	29.67% of the respondents worried about being targeted for hateful or degrading material online. 70.33% of the respondents did not worry about being targeted for hateful or degrading material online.
26	Virtanen (2017)	For eight online crime forms [identity theft/fraudulent emails asking for personal details/online fraud/accidently encountering child pornography/accidently encountering material that promotes racial hatred or religious extremism/not being able to access online services due to cyberattacks/social media or email account being hacked/becoming a victim of online banking or creditcard fraud] respondents were asked how **concerned** they were about falling victim to these crimes, on a 4-point scale (from 0, not concerned at all to 3, very concerned). All items were summed together to form a 'general fearfulness' variable (0–24), which represents severity of fear of different forms of cybercrime.	Emotion(s): concern. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **Fear of cybercrime.**	Fear of cybercrime: 10.84. Out of a possible 0–24.
27	Vozmediano et al. (2013)	For eleven cybercrime forms [Virus that harms computer/Spying of activities in the internet/Distribution of private data, photos, or videos/Faking or displacing identity/Access without permission to the computer's content/Access of other people to one's accounts/Bank movements without permission/Non authorized use of one's credit cards/Receiving spam or not desired	Emotion(s): concern. Cybercrimes: various, specific cybercrimes. Outcome: single emotion and different cybercrimes combined into a single measure: **Concern of being a victim.**	Concern of being a victim: 3.73. Out of a non-specified 5-point scale.

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Table 2 (*continued*)

Study number for in text reference	Authors (publication year)	Measure fear (bold) and type of cybercrime (underlined).	Summary of question characteristics, and terminology used by authors (bold).	Reported intensity, mean(s).
		e-mails/Cyberbullying/Cyberbullying of a sexual type] respondents were asked about their **concerns** about being a victim to these crimes, on a 5-point scale (not concerned at all to very concerned). The scores were combined into a single concern about cybercrime score (specific Cronbach's α not reported).		
28	Yu (2018)	Respondents were asked to respond to four statement about their fear of becoming a victim of identity theft or online fraud as a result of online shopping, on a 10-point scale (from 1, extremely disagree to 10, extremely agree) - I am **worried** about being a victim of identity theft when shopping on Amazon. - I am **worried** about being a victim of online fraud when shopping on Amazon. - I am **afraid** of being a victim of identity theft when shopping on Amazon. - I am **afraid** of being a victim of online fraud when shopping on Amazon. The scores were combined into a single fear of victimization score (Cronbach's α = 0.83).	Emotion(s): fear and worry combined. Cybercrimes: various, specific cybercrimes. Outcome: different emotions and different cybercrimes combined into a single measure: **fear of victimization.**	Not reported.

[a] The mentioned number does not correspond with what is described in the method section. From this point onwards, we shall use the scores that are reported in the article.

[b] Note that this study builds on study 2 from Hille, Walsh and Cleveland, 2015, containing 4 items for fear of reputational damage, whereas the final scale in Hille, Walsh and Cleveland, 2015 (study 3) is constructed using three items (see above).

[c] We interpreted it as such that the study builds on this measure in the reporting of results.

(3)) and De Kimpe et al. (2020 (7)) find non-significant relationships between crime type and fear of cybercrime. Victims who have received exaggerated messages of affection in Pereira and Matos (2016) report greater *fear following cyber-victimization.* They also report that cyber-stalking persistence predicts greater *fear following cyber-victimization,* which is also the case in Pereira, Spitzberg and Matos (2016). This latter study also differentiates between 18 types of victimization; again "*[the] most fear evoking behavior was receiving exaggerated messages of affection*" (141), but also for nine other types of victimization a significant relationship with *fear following cyber-harassment victimization* is reported. In Nobles et al. (2014) *fear at onset* was greater for stalking victims as compared to cyberstalking victims. Fissel (2021 (12)) reports an inconclusive relationship between offense seriousness and *fear as a result of repeated online pursuit behaviors*. All studies above score average to highest quality, with the exception of Begotti and Maran (2019) which, on the basis of the criteria used in this study, scored lowest in quality.

Fissel (2021 (12)), Perreira and Matos (2016 (21)) and Pereira et al. (2016 (22)) also investigate if characteristics of a victim's cyber-stalker affects their reported fear. Perreira and Matos (2016 (21)) find that age of the cyber-stalker is (positively) related to reported *fear following cyber-victimization*, while the cyber-stalker's gender is not. In Pereira et al. (2016 (22)) respondents reported more *fear following cyber-harassment victimization* when they were victimized by males, unknown cyber-aggressors and older cyber-aggressors. Fissel (2021 (12)) reports lower probability of people reporting *fear as a result of repeated online pursuit behaviors* when the offender is their previous intimate partner, a classmate and especially a friend, as compared to their current intimate partner. She also investigates the perceived cyberstalker motivation: victims who perceived the offender's motivation to be retaliation or revenge, or feeling rejected were significantly more likely to report fear. If the motivation was perceived to be affection, victims were significantly less likely to report fear. Several other victim-offender relationships, as well as motivations are included in the model, but these do not reach significance.

One study (22) also investigated if being both victim and offender of online crime is related to differences in reported fear of crime, but reports a non-significant relationship.

5.3.3. Perceived risk

There were seven studies that reported on perceived risk as antecedent of fear of cybercrime. Six out of seven studies (5, 13, 14, 17, 21, 27) report a positive relationship, meaning that respondents that perceive greater risk of falling victim to online crime also report greater fear of cybercrime. Maddison and Jeske (2014 (18)) report a non-significant relationship between perceived likelihood of victimization and *fear of cyber-victimization*. All of these studies have an average quality score, with the exception of Pereira and Matos (2016 (21)) (high) and Vozmediano et al. (2013 (27)) (low).

Somewhat relatedly, Chen and Zahedi (2016 (5)) report a significant positive relationship between perceived severity of internet security attacks and between what they label as *perceived security threat* (upon a closer look at the questions asked: fear, worry and anxiety about internet security attacks).

5.3.4. Online exposure, opportunity or internet use

Seven studies were included in this category. Results between studies are very mixed, as well as inconclusive within studies. This is likely due to the differences in the ways this predictor is operationalized. All quality scores are average or higher. Virtanen (2017 (26)) reports a negative relationship between internet use (how often the respondents accessed the Internet at work, home or in public) and *fear of cybercrime*, in one out of three models used. Brands and Van Wilsem (2021 (4)) report a negative relationship between the number of PCs in the household and the use of a smartphone (as proxies of the possibilities to spend time and go online), and *fear of online financial crime*. No significant relationship is found for the use of a PC or laptop, or the use of a tablet. On the contrary, in Henson et al. (2013 (13)), hours spent online per day did not reach significance, and neither did the type of online programs used. Neither did social networking sites usage time reach

Table 3
Antecedent measures of fear of cybercrime reported in the included studies.

Antecedent measure of fear of cybercrime	Times included	Significant positive relationship, N (study numbers)	Significant negative relationship, N (study numbers)	Non-significant relationship, N (study numbers)	Inconclusive about the relationship, N[a] (study numbers)
Gender (female)	15	10 (4,6,7,10,13,17,18,21,22,26)	0	5 (1,2,9,12,24)	0
Age (older)	13	5 (2,4,7,17,24)	3 (6,12,26)	4 (1,9,10,22)	1 (13)
Victimization (victim)	9	7 (1,4,6,10,11,17,26)	0	1 (9)	1 (13)
Education (high level)	8	2 (2,6)	1 (4)	5 (1,7,9,18,24)	0
Perceived risk/likelihood (high)	7	6 (5,13,14,17,21,27)	0	1 (18)	0
Online exposure/opportunity/ internet use (high)	7	1 (18)	0	2 (13,17)	4 (4,6,24,26)
Type of (cyber)crime victimization	6	1 (21)	1 (19)	2 (3,7)	2 (12,22)
Income (high)	6	2 (2,6)	0	4 (1,4,9,24)	0
Offender characteristics/ victim-offender relationship	3	1 (22)	0	0	2 (12,21)
Race	3	0	0	3 (1,12,13)	0
Relationship status	3	1 (6)	0	2 (1,13)	0
Employment status (employed)	2	1 (6)	0	1 (9)	0
Participant is also offender	1	0	0	1 (22)	0
Public school	1	1 (22)	0	0	0
Social network	1	0	0	0	1 (17)
Collective efficacy	1	0	0	1 (17)	0
Disorder	1	1 (17)	0	0	0
Self-efficacy	1	0	0	1 (18)	0
Protective behaviors/measures (use)	1	0	0	1 (9)	0
Resting anxiety	1	0	0	0	1 (9)
Digital privacy importance (high)	1	0	1 (11)	0	0
Self-control	1	0	0	1 (14)	0
Online privacy concern	1	1 (15)	0	0	0
Online trust	1	0	1 (15)	0	0
Self-esteem	1	0	0	1 (18)	0
Parental control	1	0	0	1 (21)	0
Fear of traditional place-based crime (high)	1	1 (24)	0	0	0
Culture (Korean v/s American)	1	1 (10)	0	0	0
Location	1	0	0	1 (24)	0
Social status (low)	1	0	1 (26)	0	0
Knowledge of risks	1	0	0	0	1 (26)
Confidence in abilities	1	0	1 (26)	0	0
Perceived severity	1	1 (5)	0	0	0
Knowledge of cybercrime	1	0	0	1 (1)	0
Online proximity to motivated offender	1	1 (2)	0	0	0
Target suitability	1	0	0	1 (6)	0

[a] A study may present inconclusive research findings on a relationship between a predictor and fear of cybercrime for various reasons. One possibility is that a relationship is found for one type of cybercrime and not another. Another possibility is that a variety of emotions are measured and independently modelled against the predictor. Finally, the predictor may also consist of multiple variables and in-between these variables some may show different relationships with fear of cybercrime.

significance in Lee et al., (2019 (17)).

In Roberts et al. (2013 (26)) positive relationships are reported for internet use at home, how often the internet is used, as well as how important the internet was in informing participants views of crime trends and the criminal justice system. Internet use at work did not reach significance. Also Maddison and Jeske (2014 (18)) report a positive relationship between internet use (based on a seven item measure) and fear of cyber-victimization. It should be noted, however, that it was only tested in combination with perceived likelihood of cyber-victimization: When internet use was high, high perceived likelihood of cyber-victimization resulted in a similar level of fear of cyber-victimization as when perceived likelihood is low. Finally, Choi et al. (2021 (6)) report on participants 'Online exposure to motivated offenders' which we merged under the current category. While they found participation in online banking and online shopping to be positively related to fear of identity theft, participation in blogging, online messaging, online gaming and peer-to-peer (P2P) activities did not reach significance.

5.3.5. Fear of traditional crime

Roberts et al. (2013 (24)) is the only study that includes fear of traditional crime as indicator of fear of cybercrime. Interestingly, they found that fear of traditional crime is a strong (positive) predictor of *fear of cyber-identity theft and related fraudulent activity*, in their model accounting for 14.8% of the unique variance of 24.4% in total. This study is scored to be of high quality.

Elhai and Hall (2016 (9)) however include resting anxiety as an antecedent for their measure of *data breach anxiety*. For five out of ten measures of hacking they report a positive relationship: those with higher resting anxiety report greater *data breach anxiety* ratings, even though they mention that *"correlations were small in absolute size, suggesting that resting anxiety did not seem to have a strong impact on anxiety ratings in response to potential data breaches"* (182).

Table 4
Fear of cybercrime as predictor in the included studies.

Outcome measure, predicted by fear of cybercrime.	Times included (respective study number (s))	Significant positive relationship (N)	Significant negative relationship (N)	Non-significant relationship (N)	Inconclusive about the relationship (N)[a]
Protective behaviors/measures/computer security	5	4 (2,5,11,19)	0	0	1 (4)
Online purchasing/purchasing intention/online shopping/shopping tendency	4	0	1 (4)	1 (28)	2 (2,15)
Help seeking	2	2 (5,22)	0	0	0
Online victimization	2	2 (20,23)	0	0	0
Online Banking	1	0	0	0	1 (4)
Perceived severity	1	1 (7)	0	0	0
Perceived control	1	0	1 (7)	0	0
Self-blame	1	1 (7)	0	0	0
Denial	1	0	0	1 (7)	0
Perceived risk/likelihood	1	1 (16)	0	0	0
Disquietude intensity when exposed to online hate	1	1 (25)	0	0	0
Avoidance	1	1 (5)	0	0	0
Password management and personal information disclosure	1	1 (2)	0	0	0
Reporting to the police	1	0	0	0	1 (8)
Reporting to other organizations	1	0	0	1 (8)	0

[a] A study may present inconclusive research findings on a relationship between fear of crime and an outcome measure for various reasons. One possibility is that a variety of outcome measures are measured, as a means to approach the construct of interest. In addition, the fear of crime may also consist of multiple variables and in-between these variables some may show different relationships with the outcome variable of interest. Finally, studies can report differences in outcome measures per type of cybercrime.

5.3.6. Other

A number of other predictors only appear in a single study, and will be discussed here. Lee et al. (2019 (17)) included a variable for social network in their model. They report a positive relationship between bridging network[4] and *fear of online victimization*, but a non-significant relationship between bonding network and *fear of online victimization*. They also report a positive relationship between people's perceptions of levels of disorder on social networking sites and *fear of online victimization*. In turn, Hille et al. (2015 (15)) report a positive relationship, between online privacy concern and *fear of financial losses*.

Elhai et al. (2017 (11)) report a negative relationship between digital privacy importance and *hacking anxiety*, whereas in Hille et al. (2015 (15)), respondents with higher online trust report lower *fear of financial losses*. Results from Virtanen (2017 (26)) indicate that those with greater confidence in abilities report lower *fear of cybercrime*. In one out of three models presented in this same study, also a negative relationship between knowledge of risk and *fear of cybercrime* is reported.

For collective efficacy (17), self-efficacy and self-esteem (18), protective behaviors and measures (9), self-control (14), parental control (21), knowledge of cybercrime (1), and target suitability (6), non-significant relationships are reported with fear of cybercrime.

5.4. The fear of cybercrime as predictor

Less studies were identified that use fear of cybercrime as predictor. This will, in part, also explain the somewhat limited overlap in terms of outcome variables reported in Table 4.

Still, four studies (2, 5, 11, 19) report that higher fear of cybercrime predicts greater use/practice of protective measures/behaviours. More specifically, in Akdemir (2021 (2)) a positive relationship is reported between *fear of cybercrime* and deleting suspicious emails without opening them, solely downloading known files or programs, adjusting website account settings, and scanning the computer regularly for viruses or other malicious software. Chen and Zahedi (2016 (5)) report a positive relationship between *perceived security threat* and protective behavior. Respondents were asked, *"my actions to protect me against Internet security attacks can be characterized as"* (in) frequent, (not) well planned, with (no/many) precautions. Elhai et al. (2017 (11)) report a positive relationship between *hacking anxiety* and digital privacy protection behavior. Respondents who reported greater fear at the onset of cyberstalking behavior, as well as those who reported greater fear over time, reported more self-protective behaviours in Nobles et al. (2014 (19)). On the contrary, Brands and Van Wilsem (2021 (4)) (quality score: 4) report a negative relationship between *fear of online financial crime* and the use of a spam filter, and security using a secured (coded) wireless network. Also taking into account the other four studies, this negative relationship is somewhat unexpected. A difference with the previous studies is that these authors are more specific in their questions in terms of the type of protective measures implemented. Further study using longitudinal data in order to dissect causal relationships is advised. For the presence or absence of a firewall, virus scanner, anti-spyware, Trojan scanner, no significant relationships are reported in Brands and Van Wilsem (2021 (4)).

Brands and Van Wilsem (2021 (4)) also investigated online purchasing as outcome variable. Respondents to their study who report greater *fear of online financial crime* have smaller probabilities of engaging in online purchasing, and tend to spend less time on the activity. For online banking, which was also studied by Brands and Van Wilsem (2021 (4)), it is shown that respondents who report greater *fear of online financial crime* have smaller probabilities of engaging in online banking. No significant result is reported for time spent on online banking however. Hille, Walsh and Cleveland (2015) also report a negative relationship between *fear of financial losses* and online purchase intention, but a non-significant relationship between *fear of reputational damage* and online purchase intention. In contrast, Akdemir (2021 (2)) reports that *"fear of cybercrime did not deter Internet users from shopping online"* (616). Those who have greater *fear of cybercrime* continued online shopping and did not employ avoidance behavior. At the same time, those who have greater fear did have greater probabilities to only purchase items from secure websites, check for signs that a site is secure, and to only use well-known or trusted sites. Yu (2018 (28)) reports a non-significant relationship between online shopping tendency and *fear of victimization*.

Two studies (5, 22) included help seeking as outcome measure. In Chen and Zahedi (2016 (5)) a positive relationship is reported between

[4] "Bridging is characterized by weak social ties with new people based on the extended network, highlighting sharing and exchanging information openly and freely" (Lee at al., 2019, p. 19).

perceived security threat and help seeking. The latter was measured using a composite scale measure including items about the frequency of help seeking in general, with professionals and with 'others'. Also in Pereira et al. (2016 (22)), greater *fear following cyber-harassment victimization* resulted in increased chances of seeking help.

Two studies (20, 23) find a positive relationship between fear of cybercrime and cybercrime victimization. Oksanen and Keipi (2013 (20)) report that those who *worry about cybercrime re-victimization in the next* 12 months tend to be more often cybercrime victims. In Rasanen et al. (2016 (23)), respondents were asked *"I worry about being targeted for hateful or degrading material online"* (yes/no) which was found to be a predictor of victimization by online hate material.

Finally, a number of outcome variables only appear a single time in this systematic review. De Kimpe et al. (2020 (7)) report a significant positive relationship between *fear of cybercrime* and perceived severity and *fear of cybercrime* and self-blame, but a negative significant relationship with perceived control. No significant relationship is found for denial. Jordan et al. (2018 (16)) report a positive relationship with perceived risk, which was measured on a scale including *"I am worried about the value of the product I received does not meet its price"* (148–149), which is presented as an example question in this study. One could question if this (example question) indeed taps into risk perceptions, or if the reported correlation might (in part) be explained by overlap in the emotional dimensions between the dependent and independent variables. More generally, this study was scored as low quality. Chen and Zahedi (2016 (5)) also report a positive association between *perceived security threat* and avoidance of internet environments. Savimäki et al. (2020 (25)) report a positive relationship between *worry of victimization* and disquietude intensity when exposed to online hate. In turn, Akdemir (2021) also reports a significant positive relationship between *fear of cybercrime* and password management and personal information disclosure. Respondents who reported greater fear were more likely to use more complex and many different passwords, and were also more likely to be careful with adding persons and posting personal details on social networking sites. Finally, Van de Weijer et al. (2020 (8)) investigated the relationship between *fear of cybercrime victimization* and reporting to the police and to other organizations. They do so by using an experimental vignette study and survey study with a sample of actual victims. In the vignette study, but not in the survey study, they find a positive significant relationship between fear of cybercrime victimization and reporting to the police. A non-significant result was found for reporting to other organizations, in both the vignette study and the survey study.

6. Conclusion and discussion

On the basis of a systematic review of the current state of fear of crime scholarship in online environments (up to and including the fifteenth of July, year 2021), we find that a limited number of studies from a range of (sub)disciplines have studied the fear of cybercrime, using a variety of measures. Measures used in the individual studies tended to differ both in terms of the particular emotion measured (fear, worry, anxiety, concern), and the type of cybercrime it related to (a specific type of cybercrime, multiple cybercrimes taken together, or cybercrime in general). Looking at the reported fear intensity, findings seem to suggest that people generally experience low to moderate levels of fear. Though, caution is warranted given the great diversity of measures used to measure levels of fear.

Despite the wide variety of measures used in these individual studies, a number of indicators were found to be quite consistently related to fear of cybercrime. Most studies reported a positive significant relationship between gender and fear of cybercrime, indicating that women tend to report greater fear of cybercrime. Also, victimization was quite consistently related to fear of cybercrime. In most studies, people who were victimized in the past tended to report greater fear of cybercrime. Most studies that included perceived risk as an indicator of fear of cybercrime also report a significant positive relationship. For other indicators, results were more mixed, or the number of studies in which they were included was limited. The general fear of crime literature, combined with the theoretical sections of the studies included in this review, might guide us in interpreting and understanding the mechanisms underlying these relationships.[5]

Looking at the included studies in this systematic review, most tend to include gender as control variable, or are unspecific about the role of the variable. Several studies build on a mechanisms drawn from the general fear of crime literatures. Virtanen (2017), for instance, theorizes the relationship between gender and fear of cybercrime using both the vulnerability model, and the shadow of sexual assault hypothesis. Part of the shadow of sexual assault hypothesis (Ferraro, 1996; Fisher & Sloan, 2003; Hirtenlehner and Farrall, 2014; Warr, 1984, 1985), it is argued that fear of sexual assault overshadows other fears: there is always a lurking risk that crime may develop into sexual assault. As sexual assault is a quite gender specific crime, this may be an explanation why women generally report greater fear of crime. Yet, many cybercrimes are characterized by the separation in space and time of the offender and victim, which arguably could also limit the (perceived) overshadowing effect of sexual assault. An interesting question then is if this theory would (in case of cybercrimes that do have some relation to, or overlap with, the offline world; i.e. cyber-assisted and cyber-enabled crimes; Wall, 2007; 2017) be valid and applicable to online contexts more generally. Indeed, some studies (e.g. Akdemir, 2021; Pereira and Matos, 2016; Virtanen, 2017) have suggested gender differences to be especially pertinent to online interpersonal crimes. We do not find unanimous support for this suggestion however, as we also encounter studies that report a gender effect for crimes that could be regarded as less 'interpersonal'. Qualitative inquiry might help explore this further, as well as the regularly reported relationship between gender and fear of cybercrime more generally.

The vulnerability thesis (see Jackson, 2009; Killias, 1990; Killias and Clerici, 2000) theorizes how (assessments of) victimization likelihood, control and consequence relate to fear of crime. Indicators such as gender are often used as proxies assumed to (partially) overlap such aspects. Women, for instance, are often assumed to be less capable to defend themselves with impeding victimization, and it is sometimes argued that women assess the consequences of victimization as more dire, which might then explain greater levels of reported fear. As in Jackson (2009), it would also be interesting to study vulnerability beyond proxies, such as gender, and hence investigate how the assessments of likelihood, control, and consequence translate to online environments and experienced fear of crime (see Virtanen, 2017 and Chen & Zahedi, 2016 who touch upon this, for the included studies). Another example of a study which mobilizes the vulnerability thesis is Brands and Van Wilsem (2021), but they mention that physical vulnerability (e.g. being able to defend oneself) might be less conducive to the relationship between gender and fear in online contexts. They suggest that future research could also explore if gender effects may also be understood through social vulnerability, where women are socialized into being (more) fearful (see also Pain, 2001; Rader and Haynes, 2011).

Victimization, in turn, is a widely studied indicator of general fear of crime. Yet, while a positive relationship is sometimes assumed, results in the general fear of crime literature tend to be somewhat mixed (Skogan, 1987; Farrall, Jackson and Gray, 2012; Hale, 1996; Rader, 2017). In this light, it is somewhat surprising that victimization was quite consistently related to fear of cybercrime in the current study. In addition, the (direct or personal) victimization model has been supplemented with the indirect- or vicarious victimization model (Hale, 1996; Rader, 2017). Part

[5] Even though the authors would underline that it cannot unproblematically be assumed that 'offline' theory would also be applicable in online contexts. This needs rigorous testing, but nonetheless is considered to be of added value in interpreting results reported.

of the indirect- or vicarious victimization model, it is argued that learning about crime victimization, through secondary sources, may also foster fear of crime. Indeed, the included study of Henson, Reyns and Fisher (2013) reports some interesting differences between direct and indirect victimization and their relationships with fear of cybercrime, worthy of further investigation. More generally, differentiation between direct and indirect victimization in the study of fear of cybercrime might hold promise taking into consideration the prominence of cybercrime discourse and communication in contemporary society (Wall, 2008; Yar, 2011).

Part of the vulnerability framework, presented above, the relationship between risk perception and fear of crime was already touched upon. More generally, and reflecting on the conceptualisation of (general) fear of crime, we also expected studies to report a positive and significant relationship between risk perception and fear of crime. Indeed, the literature has generally suggested that the two should be studied separately as different constructs, even though they are closely related (Ferraro, 1995; Hicks and Brown, 2013; Rader, 2004; Rader et al., 2007; Virtanen, 2017).

Interestingly, Roberts, Indermaur and Spiranovic (2013) is the only study that includes fear of 'traditional' crime as indicator of fear of cybercrime in their final model, and they found that fear of traditional crime is a strong (positive) predictor of *fear of cyber-identity theft and related fraudulent activity*. To be noted is that Madisson and Jeske (2014) investigate various theoretical mechanisms for both offline and online contexts, and in their (preparatory) correlation matrix also report a relationship between fear of victimization and *fear of cybervictimization*. 'Overlap' between 'offline and online' fears might be another direction for further research. Roberts, Indermaur and Spiranovic (2013) mention the possibility of fear of cybercrime to be *"partially driven by an existing generalized fear component towards all types of crime"* (324).

Fifteen included studies (also) used fear of crime as a predictor of another outcome variable. While various relationships are reported in the results section, these are most often based on a single study. The relationship between fears of and worries about cybercrime and what might be coined 'constrained behavior' is the exception; four out of five studies report a positive significant relationship between fear of cybercrime and protective behaviors/measures, two out of four with decreased online shopping/purchasing, one out of one with reduced online banking, and one out of one with avoidance behavior. The link between fear of crime and (constrained) behavior is also well documented part of the general fear of crime literatures (Rader, 2004; Rader et al., 2007), and further underlines the societal relevance of studies into fear of (cyber)crime. It is especially where fear of crime 'surfaces' through constrained behaviors that it becomes especially tangible, limiting individuals in their everyday lives. While various avoidance and defensive behaviors are already investigated (see above), we would argue that more studies investigating the (causal) relationship between online fears and online behaviors would be a welcome addition.

6.1. Limitations

Several limitations should also be discussed for the current study. Firstly, no studies have been eliminated based on their score in the quality assessment. We chose to include all studies, as our aim was to provide a complete overview regarding the fear of cybercrime. The current review therefore also includes some lower quality studies that may be less suitable in answering our research question. However, the quality of the included studies is considered in the interpretation of the results. Secondly, only peer reviewed studies, published in academic journals reporting in English were included, which means that the set of studies in this systematic review is by no means complete. Finally, the current systematic review does not contain a meta-analysis on the fear of cybercrime. Instead we chose to highlight and critically reflect on the methods used to measure fear of cybercrime. Furthermore, our aim was not to describe the size of an effect as is typically done with a meta-analysis (e.g., Petticrew and Roberts, 2006), but to give an extensive overview of studies on the phenomenon, including its correlates. Performing a meta-analysis might also be problematic due to the diverse set of designs and variables used in the included studies.

Although we specifically chose to focus on the emotional dimension to the subjectively conceived threat of criminal victimization, it could be argued that this focus somewhat limits our conclusions. For example, focusing on fear in relation to crime in online environments meant that we did not include studies that looked at emotions such as anxiety as a trait or a mental health related variable. While (fear of) cybercrime victimization can have detrimental effects on victims (research shows an association between fear of crime and poorer mental and physical health; see for example Stafford, Chandola and Marmot, 2007 or Pearson and Breetzke, 2014) and psychological care might be needed, adding such a reflection goes beyond the aim of the current review. For a review on the consequences of online victimization for mental health, including depression and anxiety, please see the work by Stevens et al. (2021). Furthermore, we chose not to include studies on (fear in relation to) cyberbullying, as such behaviors (posting hurtful information, insulting, exclusion, e.g., Randa, 2013) often are not punishable by law, while in the current review we chose to focus on online criminal victimization. Again, one could argue that this forms a limitation, however, we believe that emotions experienced in relation to cyberbullying deserves its own systematic review. Finally, there is an ongoing debate in the literature about the status of fear in (cyber)stalking victimization, *"whether an individual needs to feel fearful to be considered a victim"* (Fissel, 2021: 4), and hence if (cyber)stalking sh/could be studied independently from fear. Although fear is indeed often experienced by cyberstalking victims, what characterizes stalking is that the behavior is perceived as *unwanted* by the targeted person (Van der Aa, 2010). Hence, our position here is that it is still important to outline the relation with fear to gain insight into the prevalence of fear of cyberstalking. Furthermore, these studies also provide insight into the measurement of fear; another goal of the current systematic review.

6.2. Implications

The link between perceived risk, fear of cybercrime, and constrained behaviors potentially generates an opportunity in the sphere of risk communication to stimulate (cyber) resilient behavior. While we have not drawn on evidence that online risk perceptions directly affect online (constrained) behavior – as this was beyond the scope of our study as such – we do find evidence that risk perceptions are related to fear of cybercrime, and fear of cybercrime is related to constrained behavior.[6] Raised risk perceptions (for instance, fed by general public or media discourse) might then amplify fear levels, which might in turn result in 'excessive' and unwanted behavioral adaptation (e.g. avoidance of online amenities and facilities, or individual spending on protective measures). Especially when the actual risk of falling victim to particular crimes would be low, such fears and worries may be regarded as 'dysfunctional'. The other way around, in those occasions when people remain unwittingly of risks of falling victim to (cyber)crime, amplified fears and related constrained behavior would yet be regarded 'functional' (Garofalo, 1981; Jackson and Gray, 2010; Lee, Jackson and Ellis, 2020; Warr, 2000). As fear of cybercrime is related to a variety of behaviors following the studies included in this systematic review, and is affected by a range of predictors, this provides ample opportunities to think of fear of cybercrime as both undermining experienced freedom of individuals, as well as shielding them from (potential) cybervictimization. From such a perspective, we could for instance further dissect the

[6] We yet recognize, and stress, that we should tread carefully here, as the 'causality' of this relationship is heavily debated in general fear of crime scholarship alike (Krulichová and Podaná, 2019). This highlights a need for longitudinal research in both offline and online contexts.

relationship between gender and fear of cybercrime, as reported earlier. In itself, we would argue that distinguishing between functional and dysfunctional fears of cybercrime would be another interesting avenue for further research.

All in all, we hope that the current review provides further conceptual clarity in the approach of fear of crime in online environments, and may serve as a directive to others interested in building models/theory in order to study fear of cybercrime and its correlates. While the conceptual discussion about the fear of crime, in general, is a vivid and large part of the literature as such, we hope to have slightly scoped it for cybercrime specifically.

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