It Only Happens to Others, Not to Me!
The Influence of Unrealistic Optimism Toward Negative Online Events on Intentions to Use Public Wi-Fi Networks

Master Thesis for Crisis and Security Management
Leiden University

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Words: 18664
June 7, 2020

Acknowledgments

During the process of writing my thesis, I was supported by many people who I would like to thank for their help. Without them it would have been difficult, if not impossible, to finish my research.

First, I would like to thank my supervisor Dr. Tommy van Steen. In your course *Behavioral Change Approaches to Cybersecurity* you introduced me to the exciting challenge of applying psychological theories to cybersecurity related topics. This made me curious to discover more about these fields and was the starting point of my thesis. I am also grateful to you for patiently answering the lists of questions I had prepared for every meeting. Without simply providing all the right answers, you guided me to search in the right direction for the solutions and made me think critically. Thank you for being my supervisor!

Secondly, I want to thank my second reader, Dr. James Shires, for the feedback on my research proposal and for the assessment of my completed thesis.

I want to show my appreciation to the respondents who answered the questions in my survey. In addition, I want to thank the people who helped me to distribute my questionnaire and to find respondents willing to participate in the study. Without you I would never have been able to conduct my research and analyze the data.

My thanks go out to my friends and family for supporting me during the time I was conducting the study. Sofie and Bob, thank you for reading my thesis and giving critical feedback on the content and style of writing. And Mom, thank you for bringing me all the tea I needed as liquid support. You know that tea makes everything better.

Iris Veerbeek
June 2020

Abstract

The use of public Wi-Fi networks can lead to cybersecurity risks. However, people continue to connect to these networks, possibly due to misjudging risks through unrealistic optimism. In order to explain the persistence of such risky behavior, the fields of psychology and cybersecurity are combined in this study. The central question is: '*Does unrealistic optimism about negative online events influence intentions to use public Wi-Fi networks?'* To answer this question, an experimental survey was distributed via the internet in order to influence the level of unrealistic optimism and to find out whether this affected intentions. The control group was asked to rate their chances of experiencing negative online events compared to others of the same age and gender. The experimental group received the same questions with additional information about risk factors of the negative online events. Participants were randomly assigned to one of the two questionnaires. However, results showed that the provision of information did not result in different levels of unrealistic optimism. Therefore, no conclusions could be drawn about its influence on the intention to use public Wi-Fi networks. Nevertheless, contrary to the expectations, the results revealed that people with less unrealistic optimism showed more intentions to use public Wi-Fi networks. A possible explanation is that people with more intentions to use the networks, show more of this behavior in real life, and therefore know they are more likely to experience negative events. Further research might give more clarity about the causational character of this relationship.

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1. Introduction

Over the past few decades, people used the internet more frequently and intensively, because of its convenience and accessibility (Cranor, 2008; Kern, 2004; Öğütçü, Testik, & Chouseinoglou, 2016). The increased use of the internet and electronic devices to access the internet, led to the development of cyberspace (Ben-Israel & Tabanski, 2011). Cyberspace exists of computerized networks, end-points, telecommunication networks, the internet, and information saved, processed and spread on devices and between networks (Ben-Israel & Tabanski, 2011, p. 26). Cybersecurity is the protection of this cyberspace, for example with regard to integrity, availability, and confidentiality of information. Cybersecurity also includes the security of the users of cyberspace, like individuals and companies (Von Solms & Niekerk, 2013).

Unfortunately, the cybersecurity of users can be breached. Developments to tackle the risk of a breach are mainly technical oriented, by improving the electronic devices to constrain human activities (Pfleeger & Caputo, 2012; Pfleeger, 2016). Nevertheless, humans are seen as the weakest link within cybersecurity. This is due to the fact that even the most enhanced security systems cannot prevent people from making wrong decisions that can compromise cybersecurity, like using public Wi-Fi networks (ENISA, 2018; West, 2008; Wiederhold, 2014). Using public Wi-Fi networks can lead to security implications, because the connected device is more susceptible for digital intruders who can damage or access data on the device (Watts, 2016). This can result in negative online events, for instance identity theft, getting a virus infection, or having one's password stolen (Campbell, Greenauer, Macaluso, & End, 2005). Falling victim to these events can lead to severe financial impacts (e.g. losing savings or retirements) and psychological consequences (e.g. feeling insecure, guilty, angry, or suicidal) for the people affected (CPB, 2018; Leukfeldt, Notté, & Malsch, 2018; Wiederhold, 2014).

That connecting to public Wi-Fi networks exposes users to these online events that threaten cybersecurity is increasingly becoming common knowledge (Sombatruang, Kadobayashi, Sasse, Baddeley, & Miyamoto, 2018). Internet users indicate that they become more concerned about their online privacy and cybersecurity (Miyazaki & Fernandez, 2001). Nevertheless, they continue to connect to public Wi-Fi networks for online activities like contacting others, using online social networks, and even transmitting sensitive data (Klasnja et al., 2009; Sombatruang, Sasse, & Baddeley, 2016). In doing so, they are increasing their cybersecurity risks.

Because of the major consequences of negative online events for those affected, it is of importance to reduce the cybersecurity risks. According to Wiederhold (2014, p. 131) "[P]sychology, through its insight into human nature, has a crucial role to play in mitigating this risk". By understanding human behavior, such as the use of public Wi-Fi networks, digital risks may eventually be limited and cybersecurity may be enhanced (Wiederhold, 2014). Nevertheless, despite its importance, the relationship between cybersecurity and psychology remains under-researched. Therefore a gap exists within the body of knowledge between these fields (ENISA, 2018; Nurse et al., 2015; Pfleeger & Caputo, 2012). In order to increase cybersecurity, this gap must be addressed. As the internet grows and internet-related human behavior increases, overlap between the fields develops. This leads to possibilities and the need for 'interdisciplinary collaboration' (Nurse et al., 2015, p. 3).

So far, psychological research has revealed that a link exists between continuing potentially risky behavior while being aware of the risks and misjudging these risks (Sumbatruang et al., 2018; West, 2008; Wiederhold, 2014). A way to misjudge risks is through unrealistic optimism. This means that individuals think they are less likely to experience negative events compared to others, and they think they are more likely to experience positive events compared to others (Campbell et al., 2005). Consequently, unrealistic optimism might explain why people who are aware of the cybersecurity risks of using public Wi-Fi networks continue to connect to these networks. People who use public Wi-Fi networks while being aware of the risks might feel that they are less vulnerable than others and therefore continue risky behavior. Such behavior can be influenced by intentions (Ajzen, 1991). Since the comprehensive measuring of human behavior is beyond the scope of the present research, intentions toward behavior will be measured instead. Therefore, the goal of this study is to find out whether changes in risk perception, specifically unrealistic optimism, influence intentions to use public Wi-Fi networks. To address the aforementioned gap in the literature, the research question is: '*Does unrealistic optimism about negative online events influence intentions to use public Wi-Fi networks?'*

The current study looks at several aspects to answer the research question. First, this study explores whether unrealistic optimism toward negative online events exists in accordance with previous studies. Secondly, the study looks whether this unrealistic optimism can be reduced by interventions, similar to preceding research. Moreover, the study analyzes whether a change in unrealistic optimism can result in different levels of intentions with respect to the use of public Wi-Fi networks. In addition, several factors influencing unrealistic optimism and the intention to use public Wi-Fi networks will be taken into account.

The focus of this study is on unrealistic optimism toward negative online events, as this can lead to changes in people's intentions. Due to the influence of behavioral intentions on behavior, a change in unrealistic optimism might indirectly lead to a change in the use of public Wi-Fi networks. In turn, this can possibly result in more cybersecure behavior regarding public Wi-Fi usage. Consequently, the results of this study are of societal importance. If the outcomes of the study reveal that unrealistic optimism about negative online events influences intentions to use public Wi-Fi networks, this could be taken into account when developing policy to increase cybersecure behavior. Moreover, safer behavior with respect to using public Wi-Fi networks might ultimately result in a possible reduction in online victimization. Therefore, based on the outcomes of this study, policies might be created to reduce unrealistic optimism and intentions to use public Wi-Fi networks, and to increase cybersecure behavior to prevent people from falling victim of cybercrimes.

Additionally, this research is a critical first step in combining the fields of psychology and cybersecurity. This is of importance in order to start filling the gap in the literature regarding the human factor with respect to online security (Pfleeger & Caputo, 2012). Furthermore, studies have been carried out toward public Wi-Fi usage, risk perceptions toward negative events, and unrealistic optimism in relation to internet related activities in general (Sombatruang et al., 2016, 2018; Campbell et al., 2005). Yet, unrealistic optimism in relation to the use of public Wi-Fi networks has not been analyzed. Therefore, the current study might offer valuable novel insight and a step toward the further integration of the fields of psychology and cybersecurity.

This study will proceed as follows. First, the study provides a theoretical framework in which previous research about the use of public Wi-Fi networks, cybersecurity and unrealistic optimism is outlined. Moreover, several concepts related to unrealistic optimism are explained. Based on the existing body of knowledge, hypotheses are formulated. The theoretical framework is followed by the research design. The research design explains the overall research method, data collection, operationalization, and limitations regarding validity and reliability. Subsequently, an analysis plan is presented and the results are outlined. Lastly, in the discussion and conclusion, the answer to the research question is provided. Additionally, the results retrieved from the current study are compared to findings from previous studies. Finally, limitations of the current study are outlined and recommendations for future research are proposed.

2. Theoretical Framework and Previous Research

2.1 The Use of Public Wi-Fi Networks

A public Wi-Fi network is a wireless access point, meant for public use, where anyone can login to access the internet (Cheng, Wang, Cheng, Mohapatra, & Seneviratne, 2013). These access points can be secured (meaning that a password is needed to access the network) or unsecured (meaning that no password is needed to access the network). Examples of places where public Wi-Fi is offered are public transport, restaurants, big companies, and hotels. Public Wi-Fi networks are different from private Wi-Fi networks. Owners of the latter (e.g. households and small businesses) want to protect their Wi-Fi network from unauthorized access, often with a privately kept password. Contrary to private Wi-Fi networks, public Wi-Fi networks have to be easy to connect to for every person who wants to go online via the network. Therefore, public Wi-Fi networks are often open or easily accessible, and no complicated security strategies are applied (Cheng et al., 2013). This also means that people with malicious intentions can easily get access to the Wi-Fi network, and to the connected devices. Therefore, connecting to public Wi-Fi networks can lead to cybersecurity risks (Watts, 2016).

That connecting to public Wi-Fi networks can result in cybersecurity risks is increasingly becoming common knowledge (Sombatruang et al., 2016). Yet, research shows that people continue to use the networks irrespective of their knowledge about the involved risks (Sombatruang et al., 2016, 2018, 2019). According to Sombatruang et al. (2016) connecting to public Wi-Fi networks while being aware of the risks can be the result of decision making based on misjudged risks, for example because of unrealistic optimism.

2.2 Unrealistic Optimism

Unrealistic optimism, also known as comparative optimism or optimism bias, is a concept derived from behavioral psychology and concerns perceived invulnerability. Unrealistic optimism can be defined as follows: “individuals feel that compared to other people, positive events […] are more likely to happen to them and that negative events […] are less likely to happen to them” (Campbell et al., 2005, p. 1274-1275). Many studies have been carried out with respect to this human bias (e.g. Cambell et al., 2005; Cho, Lee, & Chung, 2010; Ferrer et al., 2012). Studies demonstrate that people show unrealistic optimism with regard to many different positive and negative events. For instance, a study revealed that participants thought they were more likely to live past 80 years compared to others (positive

event), and that they were less likely to being fired from a job compared to others (negative event) (Weinstein, 1980).

Unrealistic optimism is not only shown by people in respect to offline events, but also regarding online events. Campbell et al. (2005) studied unrealistic optimism among students in relation to positive and negative online events. The results indicated that the students, compared to others, thought they were more likely to be contacted by a friend via the internet (positive online event), and less likely to experience identity theft or being stalked online (negative online event). These findings were supported by another study about unrealistic optimism and online events conducted by Cho et al. (2010).

2.2.1 Intentions and Behavior. Unrealistic optimism can influence intentions and behavior, due to the misjudgment of risks by individuals (Barnoy, Bar-Tal, & Treister, 2003; Klein & Helweg-Larsen, 2001; Rhee, Ryu, & Kim, 2005). Although research toward the influence of unrealistic optimism on online behavioral intentions and online behavior is scarce, studies have been conducted toward optimism bias and offline behavioral intentions and behavior.

Experimental studies indicate that optimism bias affects behavioral intentions to perform certain actions (Barnoy et al., 2003). For instance, increased unrealistic optimism toward negative events leads to less intentions to perform safe actions or more intentions to perform unsafe actions. Barnoy et al. (2003) found that women who thought they were less likely compared to others to get cancer showed less intentions to do a screening test. Another example is that individuals who thought that they were less likely to cause an incident on the road compared to others showed more intention to behave in an unsafe way in traffic than people who reported less unrealistic optimism (Shepperd, Klein, & Waters, 2013). Similar results about different behavioral intentions were found in a study by Dillard, McCaul, and Klein (2006). Their results revealed that smokers who knew the risks of their behavior but believed they were less likely than others to experience the negative consequences, had less intention to quit smoking compared to smokers who were not unrealistically optimistic.

As well as influencing intentions, misjudging risks due to unrealistic optimism can also directly influence risky behavior. When people feel that they are less vulnerable than others, they may make wrong decisions and exhibit dangerous behavior (Campbell et al., 2005). Sparks, Shepherd, Wieringa, and Zimmermanns (1995) showed that people were aware of the risks of unhealthy food. However, respondents seemed to be overly optimistic about the healthiness of the food they were eating themselves. Their misjudgment regarding the content of their meals was related to possible over-optimism about the dangers. This could result in

the continued consumption of unhealthy food. The researchers stated that if people would be more aware about what they were eating, they might change their risk perceptions and subsequently their diets (Sparks et al., 1995).

Another example retrieved from previous studies is that motorcyclists show unrealistic optimism regarding accidents (Rutter, Quine, & Albery, 1998). Rutter et al.(1998) measured unrealistic optimism of motorcyclists at two points in time with a year between the measurements. Results demonstrated that the respondents who indicated at the first measurement that they behaved in a risky way, showed even more risky behavior during the second measurement, even though they were aware of the risks of their behavior. The risky behavior was shown more often when the perceived risk at the first measure was high. These motorcyclists thought they were less likely compared to others to experience an accident. The results also revealed that the respondents who behaved less safe did not take extra self-protective measures, like wearing a helmet or a protective motor suit, during the second measurement compared to the first measurement. This study showed that while the respondents were aware of the risks of their behavior, they continued to engage in (increasingly) unsafe behavior due to unrealistic optimism (Rutter et al., 1998).

In general, these studies indicate that people who are more unrealistically optimistic regarding negative events behave less safe or have less intention to behave safely than people who are less unrealistically optimistic, regardless of their risks-awareness. Therefore, unrealistic optimism might explain the continued use of public Wi-Fi networks despite the now common knowledge about its cybersecurity implications.[1]

2.2.2 Reducing Unrealistic Optimism. That unrealistic optimism can lead to unsafe behavior has been acknowledged by many academics. Therefore, several studies have been conducted to find out whether unrealistic optimism can be reduced (e.g. Perrissol, Smeding, Laumond, & Le Floch, 2011; Weinstein, 1983; White, Cunningham, & Titchener, 2011). The results of the studies showed that interventions like trainings and providing information to increase awareness can lead to a reduction of unrealistic optimism. For instance, Perrissol et al. (2011) provided a training course on risk perceptions about traffic accidents. The people who participated in the course showed a reduced level of unrealistic optimism. Another way to reduce unrealistic optimism is by providing information about risk factors and the number

[1] Although the current study focuses on the negative influence of unrealistic optimism, i.e. continuing unsecure behavior, it is important to note that unrealistic optimism does not only result in negative implications and unsafe behavior. On the contrary, Kress and Aue (2019) found that increased unrealistic optimism for people with a psychological disorder could improve their mental health.

of victims of a negative event (Weinstein, 1983). However, these studies exclusively looked at the reduction of unrealistic optimism regarding offline events. Therefore, the current study focuses on reducing this optimism for online events to find out whether it can be reduced by similar interventions.

2.2.3 Event Related Moderators. The level of unrealistic optimism of people is influenced by event related moderators (Campbell et al., 2005). The moderators are subject to personal judgments of the respondents toward the happening of an event in general. Several moderators exist that can influence unrealistic optimism. The first is perceived controllability of an event in general. Academics found that perceived controllability of an event is significantly related to unrealistic optimism regarding that event (e.g. Campbell et al., 2005; Cho et al., 2010; Harris, 1996; McKenna, 1993; Weinstein, 1980, 1982; Zakay, 1996). People think they are less likely to experience a negative event compared to others when they feel like they are more in control over the negative event. So, more perceived controllability with respect to a negative event in general leads to more unrealistic optimism regarding that event. When people think an event is beyond their control, unrealistic optimism decreases (Klein & Helweg-Larsen, 2001; Shepperd, Waters, Weinstein, & Klein, 2015). This relationship can be explained by the fact that more perceived controllability leads to a lower perceived personal risk. In other words, the idea of being in control of an event leads to feeling less vulnerable (Cho et al., 2010).

Another moderator that influences unrealistic optimism is the perceived likelihood or probability that a negative event will occur in general (Campbell et al., 2005; Weinstein, 1980). When people feel that a negative event is more likely to happen in general, unrealistic optimism toward this event decreases (Campbell et al., 2005). According to Hoorens (1994), if the perceived probability that a negative event will occur is low, people expect the probability that they will experience that event to be even smaller compared to others. However, they may forget that the low probability of occurrence does not only apply to them, but to everyone. This means that all people in general have a lower probability to experience the event (Hoorens, 1994).

With respect to the third moderator, perceived severity of an event in general, the influence on unrealistic optimism is unclear (Taylor & Shepperd, 1998). Some studies revealed that people showed an increase in optimism bias when they perceived a negative event as more severe when it occurs in general (e.g. Campbell et al., 2005; Sweldens, Puntoni, Paolacci, & Vissers, 2014). However, other studies found no such effect (e.g. Van der Velde,

Hooykaas, & Van der Joop, 1992). An explanation for the diverging results is not provided in these studies.

The last moderator, personal experience with a negative online event, is negatively correlated with unrealistic optimism. Prior experience, whether the respondents experienced it themselves or knew someone who experienced the negative event, decreases the level of unrealistic optimism about the negative event (Campbell et al., 2005; Cho et al., 2010; McKenna & Albery, 2001; Weinstein, 1980). An explanation for this correlation is that people with previous experience, have higher awareness levels in respect to the event (Barnoy et al., 2003).

2.2.4 Personal Characteristics. Besides event related moderators, other variables have a possible influence on the level of unrealistic optimism. Previous studies revealed that personal characteristics like age, level of education, and gender might contribute to a variance in unrealistic optimism (Cohn, Macfarlane, Yanez, & Imai, 1995; Hansen, Hahn, & Wolkenstein, 1990; Moen & Rundmo, 2005). However, the results of the studies are inconsistent, for instance with regard to the influence of age on unrealistic optimism. Where some studies found that age was related to unrealistic optimism (Cohn et al., 1995; Hansen et al., 1990), other studies found no such effect (Moen & Rundmo, 2005). Moreover, when studies showed a significant effect of age, the direction of the relation was found to be both positive (Cohn et al., 1995) or negative (Hansen et al., 1990). It is unclear why studies show different results regarding the relationship between age and unrealistic optimism (Helweg-Larsen & Sheppard, 2001).

Besides age, another personal characteristic that might influence unrealistic optimism is level of education. Studies including this variable show opposed results with respect to unrealistic optimism. For instance, Moen and Rundmo (2005) studied the optimistic bias of skydivers, soldiers and fire fighters. They found that a higher level of education significantly decreased comparative optimism for skydivers and soldier, but not for fire fighters. In the study by Rutter et al. (1998), respondents with a higher level of education also showed less unrealistic optimism. However, Weinstein (1987) did not find a significant relationships between level of education and unrealistic optimism. In addition, the same study by Weinstein (1987) revealed no relationship between unrealistic optimism and gender, which also is a concept often included in psychology studies. Other studies did not mention the influence of gender on unrealistic optimism.

Not only did studies analyze the relationship between personal characteristics and unrealistic optimism, but also the connection between these features and intention to use

public Wi-Fi networks was explored. The results showed that women were more likely to use the networks compared to men. In addition, people who only finished high school were more likely to connect to public Wi-Fi than those who had a bachelor's or postgraduate degree (Sombatruang et al., 2018). This suggests that a higher level of education might decrease the intention to use public Wi-Fi networks. However, due to the inconsistency with regard to results about the influence of personal characteristics like age, level of education, and gender on unrealistic optimism no hypotheses are formulated based on preceding research. However, the variables will be included in the study in order to control for their possible influence.

A fourth variable that does show a clear relationship with regard to unrealistic optimism about online events is frequency of internet usage. People who use the internet more often and for a longer period of time, generally have lower risk perceptions compared to people who use the internet less frequently (Miyazaki & Fernandez, 2001). These results were confirmed by Campbell et al. (2005), who found that frequent internet users (more than an hour a day) demonstrated more unrealistic optimism towards negative online events than people who used the internet less than an hour a day. This might be due to the reduced fear after frequent use of the internet without experiencing negative online events (Miyazaki & Fernandez, 2001).

2.2.5 Self-Protective Behavior. Besides the aforementioned relationships, a correlation exists between adopting self-protective measures and unrealistic optimism. Self-protective measures are measures adopted to reduce the cybersecurity risks of using public Wi-Fi networks. These measures include installing a VPN, using HTTPS-websites, creating different passwords for different websites, switching off Wi-Fi when it is not needed, and not using public Wi-Fi networks at all (Brody, Gonzales, & Oldham, 2013). Studies revealed that people who show more unrealistic optimism have less intention to adopt these measures or behave more carefully (Rose, 2011; Rutter et al., 1998). People with higher levels of unrealistic optimism think they are less likely to experience negative events compared to others and consequently assume that they do not need measures to protect them. This theory suggests a negative relationship between unrealistic optimism and the adoption of self-protective measures.

However, it is also likely that people who adopt self-protective measures show more optimism and therefore risky behavior or intentions because they do have a lower risk of experiencing negative online events. This is what Ferrer et al. (2012, p. 815) call 'realistic optimism'. Accordingly, the adoption of self-protective measures may increase the level of comparative optimism and indirectly the intention to use public Wi-Fi networks. Using

protective measures might lead to feeling more protected against cybersecurity risks. Therefore, when studying unrealistic optimism in relation to having self-protective measures, it is important to be aware that participants who use self-protective measures might indicate higher levels of unrealistic optimism which may in fact be realistic optimism. This theory expects a positive relationship between self-protective measures and unrealistic optimism. Because this study does not look at self-protective measures and unrealistic optimism in an experimental way, only a correlation might be found, not a causation. The direction of the correlation can indicate which theory is more likely.

2.3 Hypotheses

To find out whether unrealistic optimism influences intentions to use public Wi-Fi networks, this experimental study is conducted. Following the example of other researchers like Campbell et al. (2005) and Weinstein (1980), the relationship between event related moderators and unrealistic optimism will be studied in order to find out whether the results they found are still present. In addition, the influence of unrealistic optimism on intentions to use public Wi-Fi networks will be explored. In order to conduct the study, the following hypotheses are formulated, based on the literature previously outlined:

H1: People show unrealistic optimism toward negative online events (based on Campbell et al., 2005; Rutter et al., 1998);

H2: Providing information about risk factors of negative online events reduces unrealistic optimism (based on Weinstein, 1983);

H3: Unrealistic optimism about negative online events increases the intention to use public Wi-Fi networks (based on Barnoy et al., 2003; Dillard et al, 2006; Klein & Helweg-Larsen, 2001; Rhee et al., 2005; Rutter et al., 1998).

H4: Perceived controllability of negative online events is positively related to unrealistic optimism toward negative online events (based on Campbell et al., 2005; Cho et al., 2010; Harris, 1996; McKenna, 1993; Weinstein, 1980, 1982; Zakay, 1996);

H5: Perceived probability of negative online events is negatively related to unrealistic optimism toward negative online events (based on Campbell et al., 2005; Hoorens, 1994; Weinstein, 1980);

H6: Prior experience with negative online events is negatively related to unrealistic optimism toward negative online events (based on Campbell et al., 2005; Cho et al., 2010; McKenna & Albery, 2001; Weinstein 1980);

H7: People who use the internet more frequently show more unrealistic optimism compared to people who use the internet less frequently (based on Campbell et al., 2005; Miyazaki & Fernandez, 2001);

Besides these hypotheses, two relationships will be analyzed in an explorative way. The exploratory analyses concern variables about which the results of previous studies were inconsistent. The following questions are formulated to be studied in addition to the previous stated hypotheses:

1. Does a relationship exist between perceived severity of negative online events and unrealistic optimism?
2. Do people who have self-protective measures show different levels of unrealistic optimism compared to people who do not have self-protective measures?

3. Research Design and Method

3.1 Overall Design and Procedure

In order to explore the possible effect of unrealistic optimism on the intention to use public Wi-Fi networks, this study manipulated unrealistic optimism to find out whether this resulted in a change of intentions to use public Wi-Fi networks. Therefore, two different surveys were created to which respondents were randomly assigned. The first of these surveys provided its respondents with additional information about the negative online events, such as risk factors and crime statistics, because previous research found that providing information about risk factors to participants can reduce unrealistic optimism (Weinstein, 1983). The second survey did not provide this information, thereby creating a control group in the former and an experimental group in the latter. This research method made the study an experimental research. The difference in the level of unrealistic optimism between the two groups was measured in relation to the intention to use public Wi-Fi networks. By comparing the results of the groups, a possible influence of unrealistic optimism toward negative online events on the intention to use public Wi-Fi networks could be found.

In addition to measuring intentions, an extra element was added to the survey to explore the influence of unrealistic optimism upon the safety of behavior related to public Wi-Fi networks. In order to find out whether the experimental group would behave safer than the control group regarding public Wi-Fi networks, the respondents were asked to create a password for a fictitious public Wi-Fi network. In the analysis, the passwords of the groups

were compared to see if a difference existed between the groups in level of safety of the passwords. The strength of the passwords was measured by using the website www.testjewachtwoord.nl.

Collecting data about unrealistic optimism, intentions and behavior by means of a survey was derived from previous research, since this method proved to be effective in earlier studies about unrealistic optimism in relation to negative (online) events (e.g. Campbell et al., 2005; Sombatruang et al., 2019; Weinstein, 1980). The survey was distributed via LinkedIn, WhatsApp, Facebook, and several big online fora to collect responses from various respondents. The fora that were used to distribute the survey were forum.scholieren.com, SeniorenNet, Fok!Forum, Ouders Online, SurveySwap, Wetenschapsforum, Freethinker, Senioren Startpagina, Radar Avrotros, Tweakers, and Festileaks. Spreading the survey via the internet could yield a great amount of data (Hoskin, 2012). Via social media the survey could be shared and therefore reach a wider public. Because the research focused on Dutch speakers, the survey was in Dutch.

3.2 Sample

Non-probability sampling was used to stay within the scope of the study and available time (Bijleveld, 2013; Bryman, 2016). The survey was distributed through different channels to reach a wide public in order to guarantee a diverse sample. This made results more generalizable to the Dutch speaking society. A sample of 300 to 400 respondents was needed for generalization (Bryman, 2016; SurveyMonkey Inc, n.d.).

The survey was started by 524 respondents. However, not all respondents completed the survey. The respondents who did not answer the outcome variable question (intention to use public Wi-Fi networks) were deleted from the sample. Of the people who did not complete the questionnaire, SPSS indicated that a part only opened the survey but did not answer any of the questions. No specific question was found where the majority quit answering the survey.

After deleting partial responses, 386 completed surveys remained. However, of these respondents, six people who were younger than 18 years old were excluded, as their participation required parental permission which was not accounted for. Another category of people who were deleted from the sample were the respondents who failed to correctly answer the control question. On top of that, two people answered ‘different’ with regard to gender. They were also removed, due to their low number which would not make results generalizable to the population. After deleting these cases, the number of remaining

respondents was 282. The control group existed of 139 participants. The experimental group counted 143 respondents.

Table 1 and Table 2 show the personal characteristics of the included respondents. The results indicated that 120 respondents (42.6 per cent) were male and 162 (57.4 per cent) were female. The youngest four respondents were 18 years old. The oldest respondent indicated to be 99 years old (M = 30.34, SD = 14.278). With regard to level of education, 2 respondents said that elementary school (basisschool) was their highest completed level of education. Of the participants, 43 finished high school. Nineteen respondents indicated to have completed MBO. In addition, 218 finished some degree of higher education, including propedeuse. The mode for the completed level of education was bachelor university (62 respondents, 22 per cent).

With regard to the frequency of using public Wi-Fi networks, 29 respondents replied to never use these networks, 70 respondents indicated that they rarely use public Wi-Fi networks, and 94 people indicated to use these networks occasionally. In addition, 41 respondents used public Wi-Fi networks often, 43 used it frequently, and 5 respondents said to always use these networks.

Table 1

Age (N = 282)

	Age
Mean	30.34
Median	24
Mode	22
SD	14.278
Skewness	1.751
Kurtosis	2.604
Min.	18
Max.	99

Note. SD = Standard Deviation

Table 2

Respondent Characteristics Gender, Level of Education, and Public Wi-Fi Use (N=282)

Characteristic	N	%	Cumulative %
Gender			
Man	120	42.6	42.6
Woman	162	57.4	100
Level of education			
Primary school	2	0.7	0.7
VMBO	2	0.7	1.4
HAVO	11	3.9	5.3
VWO	30	10.6	16
MBO	19	6.7	22.7
Propedeuse HBO	13	4.6	27.3
HBO	57	20.2	47.5
HBO Masters	3	1.1	48.6
Propedeuse University	28	9.9	58.5
Bachelor University	62	22	80.5
Masters University	50	17.7	98.2
Post-Master University	3	1.1	99.3
PhD	2	0.7	100
Frequency public Wi-Fi use			
Never	29	10.3	10.3
Rarely	70	24.8	35.1
Occasionally	94	33.3	68.4
Often	41	14.5	83
Frequently	43	15.2	98.2
Always	5	1.8	100

3.3 Included Variables and Conceptual Model

Depending on the analysis, unrealistic optimism and intention to use public Wi-Fi networks could both be the outcome variable. When the dependent variable was the intention to use public Wi-Fi networks, unrealistic optimism was the independent variable. To increase the validity of the research several control variables were included to correct for possible bias

(systematic mistakes) (Bijleveld, 2013). This study controlled for age, level of education, and gender, where possible (Campbell et al., 2005; Sombatruang et al., 2016, 2018). In addition, several event related moderators were included since they could influence the optimism bias (Campbell et al., 2005). The moderators that were measured in the current study were perceived probability, perceived controllability, perceived severity, and experience with the negative online event (Campbell et al., 2005). In addition to these variables, the adoption of self-protective measures and frequency of internet use were added to explore their relationships with unrealistic optimism.

Figure 1 shows the conceptual model with relationships and the direction of the relationships between the variables based on previous research. However, the results about the relationships between perceived severity and unrealistic optimism, and between self-protective measures and unrealistic optimism retrieved from previous studies were inconclusive. Therefore, these relationships were studied in an explorative way.

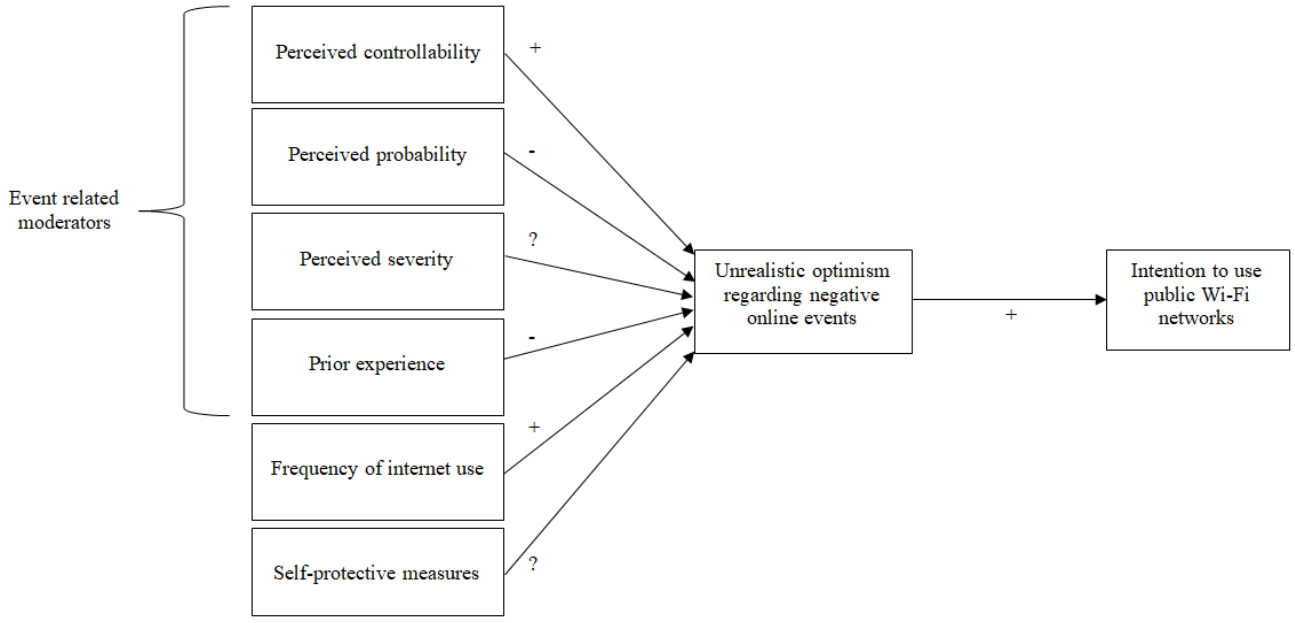

Figure 1. Conceptual model of main variables

3.4 The Survey

Qualtrics Software (2005) was used to develop the survey. This software could randomly assign respondents to one of the two surveys. Where possible, questions were based on methods used by previous studies. The survey addressed questions about the unrealistic optimism variable, the intention to use public Wi-Fi networks, the moderators, and the control variables (see Appendix 1, Survey). One control-question was added to exclude respondents from the analysis who did not answer the survey seriously. This question was: ‘Select here: a

little lower' (on a scale from 1 = much lower to 7 = much higher). The survey started with questions about the control variables (gender, level of education, and age), and the current use of public Wi-Fi networks. Subsequently, questions were asked about the event related moderators (perceived probability, perceived controllability, perceived severity, and experience with the negative events) and unrealistic optimism. The survey also included questions about self-protective measures and frequency of internet and Wi-Fi usage. The intention to use public Wi-Fi networks in the future was measured as well. To find out whether unrealistic optimism not only influenced intentions, but also cybersecure behavior related to using public Wi-Fi networks, respondents were asked to create a password to connect to a fictitious public Wi-Fi network. The strength of the passwords could show whether a difference existed with respect to the safety of the behavior between the experimental group and the control group.

3.5 Operationalization of Variables

3.5.1 The Intention to Use Public Wi-Fi Networks. Respondents were asked questions about their use of public Wi-Fi networks and their intention concerning future use. Based on a study by Dungay, Garcia, and Elbeltagi (2015), an example of a question that was asked to measure this variable is: 'How often do you use public Wi-Fi networks?' (never, rarely, occasionally, often, frequently, always). To ask about the intention to use public Wi-Fi networks in the future, the following question was asked: 'If you were in a public space where public Wi-Fi networks are offered, what is the chance that you would use this network?' To control for the influence of the survey on unrealistic optimism, this question was asked both at the beginning of the survey as well as at the end of the survey. This way, a possible difference between the two measurements in the control group might be explained by the influence of the survey itself.

In addition, this study looked at the disparity of password strength between the control group and the experimental group. Respondents were asked to create a password they could remember for the use of a public Wi-Fi network and to repeat this password. By asking the participants to create a password, the safe use of public Wi-Fi networks could be measured in addition to intention.

3.5.2 Unrealistic Optimism. Respondents were asked about their level of agreement with statements that included comparison to others. Some studies measured unrealistic optimism by asking respondents to compare themselves with an average person. However, this way of measuring can increase unrealistic optimism if participants compare themselves to

"distant, dissimilar, and vague targets" (Helweg-Larsen & Shepperd, 2001, p. 88). To reduce the influence of the target type on unrealistic optimism, the current study asked respondents to compare their risks with that of people of the same gender and age.

The negative online events that were included in this research were retrieved from the study by Campbell et al. (2005). The events presented in the study were auction fraud, online stalking, identity theft, selling personal information, someone accessing files, being harassed online, password theft, violation of email privacy, websites tracking, getting a virus, and getting spam. Campbell et al. (2005) found no significant relationship between unrealistic optimism and several negative online events (i.e. being harassed online, password theft, violation of email privacy, website tracking and getting a virus). Also, some events showed no presence of unrealistic optimism toward the event (i.e. website tracking, getting a virus, and getting spam). Nevertheless, all these events were included in the current study. The reason is that many years have passed since the study by Campbell et al. (2005) has been conducted. A lot has changed with respect to the development and use of internet and cybersecurity. This could lead to different results with regard to the negative events. However, due to unclear events and measurements included in the study by Campbell et al. (2005), some events were not included in the current study (i.e. employer email, email being read, cc stolen, employer monitor, virus infected, and being misled).

Respondents were asked to rate the chances that the negative online events would happen to them compared to their peers (Campbell et al., 2005, p. 1278). An example statement to measure unrealistic optimism is: 'Compared to another person of the same age and gender, I think the chance that I become a victim of auction fraud is …' (based on the study by Campbell et al., 2005). A 7-point Likert scale (from -3 = 'chance is much lower compared to others' to 3 = 'chance is much higher compared to others') was provided as answer-format. In addition to this statement, the experimental group was able to see the risk factors and amount of victims of the negative online events in the Netherlands in one year in order to influence their levels of unrealistic optimism. The risk factors and number of victims were based on several sources (AVROTROS, 2020; Bossler, Holt, & May, 2012; CBS, 2019a, 2019b; Claesson & Bjørstad, 2020; Eurostat, 2016; Herley, Van Oorschot, & Patrick, 2009; Holt & Bossler, 2013; Holt, Van Wilsem, Van de Weijer, & Leukfeldt, 2020; Kraft & Wang, 2010; Jansen, Leukfeldt, Van Wilsem, & Stol, 2013; Leukfeldt, 2015; Ludington, 2006; Van der Molen, 2017; Pan, Cao, & Chen, 2015; Shahin, 2017; Sipma & Van Leijsen, 2019; Van Wilsem, 2012, 2013a, 2013b). The control group received the statements without the risk factors and number of victims.

With regard to measuring and analyzing unrealistic optimism, an important note has to be made. The results of the study relate to the group, not to the individual (Weinstein, 1983). It is likely that individuals who believe they are less at risk indeed have a lower risk compared to others. However, not all individuals can be less at risk than average. If the whole group of respondents claims their risk is below the average risk, the group as a whole shows unrealistic optimism (Weinstein, 1983).

3.5.3 Control Variables. Several control variables were included in the survey. The categories for gender were male, female, and other (based on Sombatruang et al., 2019). The question about age was an open question, which was different than in most previous studies, who used categories. However, by asking about age by means of an open question, categories could be made after data collection by converting data when this seemed necessary, while changing category variables into a ratio-variable is impossible. The highest level of education completed was measured by including the categories none, basisschool, VMBO, HAVO, VWO, MBO, Propedeuse HBO, HBO, HBO master, Propedeuse Universiteit, Bachelor Universiteit, Master Universiteit, Post-Master Universiteit, PhD, and other (based on a questionnaire by Van Heelsum (2008)).

3.5.4 Event Related Moderators. Data about perceived probability of negative online events was retrieved by asking the respondents about the chances that an event would happen in general. This was measured by a 7-point Likert scale (from 1 = very unlikely to 7 = very likely), like in the studies by Sombatruang et al. (2019) and Campbell et al. (2005). An example question is: ‘In general, what is the likelihood to receive spam?’ (Campbell et al., 2005). Perceived controllability of an event was measured by asking the respondents to what extent they were in control over the negative online events on a scale from 0 = totally uncontrollable to 100 = totally controllable. Perceived severity was measured in a similar way, by asking respondents to rate the severity of an event on a scale from 0 = not severe at all to 100 = very severe. Experience was measured by asking the respondents if they, or someone they know, experienced the negative online event (Campbell et al., 2005).

3.5.5 Other Variables. Respondents were asked to indicate whether they used self-protective measures. The measures were retrieved from a study by Brody et al. (2013) and included having a VPN, using HTTPS-websites, not using the same passwords for every account, not sending sensitive information via public Wi-Fi networks, and switching off Wi-Fi when not needed. The following statement was included in the survey: ‘Are you using self-protective measures when connecting to public Wi-Fi networks?’ Respondents were able to tick the boxes which applied to them (having a VPN, using HTTPS-websites, not using the

same passwords for every account, not sending sensitive information via public Wi-Fi networks, switching off Wi-Fi when not needed, I do not use measures, I do not use public Wi-Fi networks (based on Brody et al. (2013)).

In addition to self-protective measures, questions about the frequency of using the internet were asked. An open question was used to retrieve data about the frequency of internet usage. This way, respondents could indicate the estimated hours a day they spend online, following the example of Campbell et al. (2005). During the analysis, categories could be made by aggregating data into categories if necessary for the analysis.

3.6 Limitations

3.6.1 Validity. To increase the validity of the study, several control variables were included. Additionally, previous studies and literature were used to formulate questions to adequately measure the concepts (Bijleveld, 2013). However, self-completion questionnaires can negatively impact the validity, for example because respondents might give socially desirable answers to questions (Bowling, 2005). Furthermore, by spreading the survey via the internet, the sample can suffer from a bias. For instance, not everyone within the society is online, which can lead to an unrepresentative research population and non-generalizable results (Bryman, 2016). This effect can be reduced by using data from a large number of respondents, which increases the generalizability (Bryman, 2016). However, due to the scope of this study, using non-probability sampling was an appropriate way of sampling and collecting a lot of data. In addition, although countries are different, results might be generalizable to other western countries, because the effect of unrealistic optimism ‘has been found across cultures, gender, educational levels, and age groups’ (Campbell et al., 2005, p. 1275).

3.6.2 Reliability. To ensure reliability, a large N-sample was used as research method. Moreover, because questions were based on previous research methods, it was expected that results found in this study were similar to previous findings. However, using self-report questionnaires can influence the reliability. In addition, spreading the survey within the researcher’s network might lead to an over-representation of high educated respondents between the ages of 18 and 30. This can influence results in such a way that repetition of the research by someone else might result in different findings. To reduce this shortcoming, the survey was spread through several online platforms that focused on groups with different interests and age levels.

4. Analysis and Results

4.1 Analysis Plan

4.1.1 Software. The data was analyzed by means of a statistical program, IBM SPSS Statistics (Version 25.0) to test the hypotheses and to explore relationships between variables (Bryman, 2016). All tables and the output of the analyses can be found in Appendix 2 (Tables) and Appendix 3 (Figures).

4.1.2 Scales. In order to analyze whether support existed for the hypotheses, some variables were combined into scales. Scales were created in order to conduct analyses with the variables perceived controllability, perceived severity, perceived probability, experience, unrealistic optimism, and self-protective measures. The scales were generated from their corresponding questions in the survey.

With regard to perceived probability 11 questions were asked with a response scale from 1 to 7. This means that the minimum total value could be 11*1=11 and the maximum score could be 11*7=77. Unrealistic optimism was measured on a 7-point scale from -3 to 3. The minimum score of 11*-3=-33 indicated that people rated their chance of experiencing an event as much lower compared to others. The maximum score of 11*3=33 showed that people thought they were much more likely compared to others to experience negative online events. A positive overall score showed no unrealistic optimism. A negative overall score, on the other hand, showed the presence of some level of unrealistic optimism, because people indicated they were less likely compared to others to experience the event. A total overall score of 0 would show that people thought they were as likely as others to experience negative online events.

The variables perceived controllability and perceived severity were measured on a 0 to 100 scale. This means that the minimum total scale value could be 11*0=0 and the maximum total scale value could be 11*100=1100. With regard to experience, the minimum total value was 11*0=0, indicating that people had no experience with any of the negative online events. The maximum value was 11*1=11, which showed that people had experience with all negative online events. The self-protective measure scale was created by merging the questions about the measures. This resulted in a scale from 0 (people take no self-protective measures) to 6 (people have up to six self-protective measures). For some analyses this variable was transformed into two categories, namely one group with measures and one group without measures.

4.1.3 Preliminary Analyses. Before conducting any tests, several preliminary analyses were conducted. This was of importance as the results of these tests could indicate whether a parametric test or a non-parametric test was more appropriate to apply (Pallant, 2016). As part of the preliminary analyses, the continuous variables, including the created scales, were controlled for outliers. Data with a value higher than the mean plus three times the standard deviation were indicated as outlier and therefore excluded from the analysis. This also applied to data with a value lower than the mean minus three times the standard deviation.

A second preliminary analysis was conducted to explore the reliability of the created scales for unrealistic optimism, perceived controllability, perceived probability, and perceived severity. Table 3 shows that the Cronbach's Alpha was above .8 for all scales, which indicated a good internal consistency of the scales (Pallant, 2016). The Cronbach's Alpha did not increase if an item was deleted from the perceived controllability scale and the perceived severity scale. If an item would be deleted, the Cronbach's Alpha for the unrealistic optimism scale and perceived probability scale would respectively become .864 and .906. Due to this being a minimal change and the good internal consistency of the scales, the items were not deleted from the scale.

Table 3

Cronbach's Alpha for Created Scales

	Cronbach's Alpha
Unrealistic optimism scale	.863
Perceived controllability scale	.847
Perceived probability scale	.900
Perceived severity scale	.866

The third preliminary analysis was conducted to test normality of the continuous variables. This was assessed for age, intention to use public Wi-Fi in a public space before taking the survey, hours a day spend online, intention to use public Wi-Fi networks after taking the survey, and password strength (see Table 4). In addition, normality of the data was checked for the created scales. Except for the perceived controllability scale ($D(282) = .051$, $p = .072$) and the perceived severity scale ($D(281) = .036$, $p = .200$), the continuous variables were not normally distributed ($p < .01$). Normal distribution was also checked for the control and the experimental group separately when this was necessary for the analysis (see Table 5).

Table 4

Normality Test for the Whole Sample Excluding Outliers

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Age (N = 282)	.311**	282	.000
Intention to use public Wi-Fi networks before survey (N = 282)	.116**	282	.000
Hours a day spend online (N = 280)	.157**	282	.000
Intention to use public Wi-Fi networks after survey (N = 282)	.111**	282	.000
Unrealistic optimism scale (N = 280)	.066**	280	.005
Password strength (N = 240)	.111**	240	.000
Perceived controllability scale (N = 282)	.051	282	.072
Perceived probability scale (N = 282)	.067**	282	.004
Experience scale (N = 282)	.141**	282	.000
Perceived severity scale (N = 281)	.036	281	.200

Note. df = Degrees of Freedom

**$p < .01$

Table 5

Normality Test for the Control Group and the Experimental Group Excluding Outliers

	Kolmogorov-Smirnov							
	Control group				Experimental group			
	N	Statistic	df	Sig.	*N*	Statistic	df	Sig.
Unrealistic optimism scale	138	.107**	138	.001	143	.097**	143	.002
Intention to use public Wi-Fi networks after survey	139	.131**	139	.000	143	.134**	143	.000
Perceived controllability scale	139	.083*	139	.021	143	.060	143	.200
Perceived probability scale	137	.098**	137	.002	143	.062	143	.200
Experience scale	139	.144**	139	.000	143	.136**	143	.000
Perceived severity scale	137	.043	137	.200	143	.039	143	.200

Note. df = Degrees of Freedom

*$p < .05$. ** $p < .01$

4.1.4 Tests. After exploring the data by means of preliminary analyses, appropriate tests were applied in order to test the hypotheses. To find out whether unrealistic optimism existed within the sample with regard to the individual negative online events, a *t*-test was conducted similar to the study by Campbell et al. (2005). A *t*-test was appropriate for exploring whether the mean of unrealistic optimism was significantly different from zero for the individual events (Campbell et al., 2005). In addition to exploring the level of unrealistic optimism for the individual events, a non-parametric Wilcoxon Signed Rank Test was applied to the unrealistic optimism scale. This test was appropriate due to non-normality of the data on the scale (see Table 4). The results could show whether unrealistic optimism existed toward negative online events in general.

In order to analyze the second hypothesis, whether providing information reduced unrealistic optimism, A Mann-Whitney U test was applied. This test was appropriate as the

values of the unrealistic optimism scale were not normally distributed (see Table 4). This test was useful for comparing the mean levels of unrealistic optimism of the control group and the experimental group (Pallant, 2016). A Mann-Whitney U test could also indicate whether a difference in unrealistic optimism between the two groups resulted in a change of intention to use public Wi-Fi networks. Moreover, this test was able to compare the level of intention of the control group and the experimental group.

With regard to exploring correlations between event related moderators and unrealistic optimism, a Pearson test seemed most convenient. However, before conducting this test, several assumptions had to be met, including normality of the data and linearity between the variables, according to Field (2013) and Pallant (2016). Scatterplots were analyzed before applying the tests, in order to explore the direction of the correlations between the variables and to find out whether a linear correlation existed (Field, 2013; Pallant, 2016). These plots showed that linearity was weak or non-existing ($R < .3$) for all relationships except for unrealistic optimism correlated to perceived controllability ($R = -.355$), and for unrealistic optimism correlated to the intention to use public Wi-Fi networks of the control group ($R = .302$) (Field, 2013; Mindrila & Balentyne, 2017; Pallant, 2016). Because the included variables showed no normal distribution of the data or the linearity was weak/non-existent – i.e. the requirements for a Pearson test were not met – Spearman tests were more appropriate to use in order to analyze the correlations (see Table 4 and Table 6).

For the purpose of analyzing the relationship between frequency of internet usage and level of unrealistic optimism, the group was split in high frequent and low frequent users of the internet. Subsequently, a One Way ANOVA could be conducted to find out whether a difference existed regarding high frequency and low frequency users in levels of unrealistic optimism. The analysis was conducted similar to Campbell et al. (2005).

With regard to the relationship between the level of unrealistic optimism and having self-protective measures, a Mann-Whitney U test was conducted to find out whether people with no measures had a different level of unrealistic optimism than people who had adopted measures. A Mann-Whitney U test was appropriate as the data regarding unrealistic optimism was not normally distributed (see Table 4).

During the analyses, two-tailed tests of significance were selected, even though a directional hypothesis was formulated. The reason being that if a relationship existed between the variables, but not in the expected direction, the results had to be ignored when conducting a one-tailed test (Field, 2013, p. 66). Therefore, two-tailed tests were conducted in the current study.

Table 6

Correlation Coefficient and Variance between Variables Retrieved from Scatterplot

	R	R^2
Unrealistic optimism and perceived controllability scale (N = 280)	-.355	.126
Unrealistic optimism and perceived probability scale (N = 280)	.077	.006
Unrealistic optimism and perceived severity scale (N = 279)	-.141	.020
Unrealistic optimism and intention to use public Wi-Fi networks (control group, N = 138)	.302	.091
Unrealistic optimism and experience scale (N = 280)	.170	.029
Presence of unrealistic optimism and intention to use public Wi-Fi networks (N = 219)	.255	.065
No presence of unrealistic optimism and intention to use public Wi-Fi networks (N = 63)	.114	.013

4.2 Analysis

4.2.1 Analysis Hypothesis 1. The first hypothesis predicted that unrealistic optimism existed with regard to negative online events. The results of the *t*-test in Table 7 indicated that the control group showed the expected negative direction of unrealistic optimism with regard to all individual negative online events except for receiving spam ($M = 0.094$, $SD = 1.035$, $t(138) = 1.066$, $p = .289$). A negative result showed the presence of unrealistic optimism, because participants rated their chance of experiencing an event as lower compared to others. A positive result showed that people thought their chances of experiencing the event were higher compared to their peers. The mean values for most items were significantly lower than zero ($p < .01$). This means that respondents in the control group indicated to have less chance to experience negative online events compared to others for 90.9 per cent of the items (10 of the 11 items). With regard to receiving spam, the people in the control group thought they were more likely to experience the event compared to others. However, this result was not significant. Overall, these findings showed that the respondents thought they were less likely compared to their peers to experience negative online events. Therefore the control group showed unrealistic optimism toward the individual negative online events. This finding was in accordance with hypothesis 1.

For the experimental group, the results indicated that a negative mean existed for 9 out of 11 negative online events (81.8%) ($N = 143$, $p < .001$) (see Table 7). The items website

tracking (M = 0.364, SD = 1.166, $t(142) = 1.311$, $p = .192$) and receiving spam (M = 0.119, SD = 1.084, $t(142) = 3.729$, $p > .01$) were in the opposite direction. With regard to all items, except for receiving spam ($p = .192$) and password theft ($p = .096$), the mean significantly differed from zero ($p < .01$). Overall, this means that the experimental group also viewed the chances of experiencing the negative online events generally lower compared to others. Therefore, the experimental group showed unrealistic optimism toward negative online events.

Table 7

One Sample T-Test for Unrealistic Optimism for the Individual Negative Online Events for the Control Group (N = 139) and the Experimental Group (N = 143)

	Control group				Experimental group			
	M	*SD*	*t*	df	*M*	*SD*	*t*	df
Auction fraud	-1.187	1.053	-13.285**	138	-1.343	1.056	-15.211**	142
Online stalking	-1.130	1.244	-10.702**	138	-1.441	1.282	-13.441**	142
Online ID-theft	-0.820	1.092	-8.856**	138	-0.937	1.206	-9.294**	142
Personal information being sold	-0.389	1.139	-4.021**	138	-0.462	1.203	-4.587**	142
Someone accessing files	-0.741	1.315	-6.643**	138	-0.958	1.113	-10.298**	142
Online harassment	-1.014	1.257	-9.516**	138	-1.203	1.314	-10.948**	142
Password theft	-0.309	1.166	-3.127**	138	-0.168	1.199	-1.675	142
Violation email privacy	-0.360	1.050	-4.041**	138	-0.497	1.215	-4.885**	142
Website tracking	-0.108	1.061	-1.199**	138	0.364	1.166	3.729**	142
Receiving virus	-0.547	1.309	-4.925**	138	-0.860	1.225	-8.394**	142
Receiving spam	0.094	1.035	1.066	138	0.119	1.084	1.311	142

Note. *M* = Mean, *SD* = Standard Deviation, *t* = Test Statistic for *t*-test, df = Degrees of Freedom

**$p < .01$

Table 8

Descriptive Continuous Variables[a]

	Intention before survey	Intention after survey	Password strength	Unrealistic optimism scale	Perceived controllability scale	Perceived probability scale	Experience scale	Frequency	Perceived severity scale
N	228	282	240	282(280)	282	282	282	282(280)	282(281)
Mean	41.09	40.34	37.18	-6.954(-6.77)	499.631	57.340	4.56	5.59(5.51)	770.617(772.868)
Median	39.5	35	32.5	-6(-6)	486.5	58	4	5(5)	765.5(766)
Mode	30	50	0	0(0)	480	65	3	5(5)	704(704)
SD	27.876	28.440	25.231	8.595(8.337)	188.710	11.505	2.259	2.816(2.653)	160.77(156.54)
Skewness	.260	.259	.259	-.410(-.299)	.334	-.449	.327	.925(.619)	-.253(-.081)
Kurtosis	-1.071	-1.195	-.005	.511(.325)	.254	-.166	-.305	1.418(.105)	.117(-.486)
Min.	0	0	0	-33(-32)	39	23	0	1(1)	138(342)
Max.	100	100	100	18(18)	1050	77	11	18(14)	1100(1100)

Note. SD = Standard Deviation

[a]The values in parentheses are the values after excluding the outliers.

Another analysis was conducted in addition to exploring whether people showed unrealistic optimism toward the separate negative online events. By means of a Wilcoxon Signed Rank Test, it was analyzed whether unrealistic optimism toward negative online events in general existed for both groups in the sample. After excluding an outlier, the results in Table 9 and Table 10 showed that the median of the unrealistic optimism scale was significantly lower than zero for both the control group (*Mdn* = -5, Test Statistic = 982.5, Standardized Test Statistic = -7.552, $p < .01$) and the experimental group (*Mdn* = -7, Test Statistic = 847.5, Standardized Test Statistic = -8.106, $p < .01$). This means that people perceived their chances of experiencing negative online events lower compared to their peers. These findings supported the first hypothesis.

Table 9

Descriptive Unrealistic Optimism Toward Negative Online Events in General for the Control Group and the Experimental Group[a]

	Control group	Experimental group
N	139(138)	143
Mean	-6.51(-6.32)	-7.38
Median	-5(-5)	-7
Mode	-3(-3)	-9
Std. Deviation	8.579(8.305)	8.619
Skewness	-.494(-.379)	-.335
Kurtosis	.613(.398)	.510
Minimum	-33(-30)	-33
Maximum	18(18)	15

[a]The values in parentheses are the values after excluding the outlier.

Table 10

Wilcoxon Signed Rank Test Unrealistic Optimism Toward Negative Online Events in General

	Control group	Experimental group
N	138	143
Test Statistic	982.5**	847.5**
Standard Error	425.058	445.079
Standardized Test Statistic	-7.552	-8.106
Asymptotic Sig.(2-sided test)	.000	.000

**$p < .01$

4.2.2 Analysis Hypothesis 2. After excluding an outlier from the analysis, the results revealed that the control group had a minimum overall unrealistic optimism value of -30 and a maximum overall value of 18 (M = -6.32, SD = 8.305, N = 138) (see Table 9). The experimental group showed a minimum score of -33 and a maximum score of 15 (M = -7.38, SD = 8.619, N = 143). The results of the Mann-Whitney U Test, reported in Table 11, indicated that the differences between the groups in level of unrealistic optimism was not significant (Mann-Whitney U = 9016, Standardized Test Statistic = -1.251, p = .211). Hence, it could not be assumed that providing information about risk factors and the number of victims reduced the level of unrealistic optimism regarding negative online events. Consequently, the results did not support hypothesis 2.

Table 11

Comparing the Mean Level of Unrealistic Optimism between the Control Group (N=138) and the Experimental Group (N=143)

Mann-Whitney U test	
Mann-Whitney U	9016
Test Statistic	9016
Standard Error	680.382
Standardized Test Statistic	-1.251
Asymptotic Sig.(2-sided test)	.211

4.2.3 Analysis Hypothesis 3. The third hypothesis stated that unrealistic optimism about negative online events would increase the intention to use public Wi-Fi networks. However, due to the fact that no difference existed between the control group and the

experimental group regarding the level of unrealistic optimism, no analysis could be conducted to find out more about its influence on the intention to use public Wi-Fi networks. Consequently, the current study could not analyze whether unrealistic optimism about negative online events had any effect on intention to use these networks or the creation of safe passwords.

Nevertheless, the correlation between the unrealistic optimism scale and the intention to use public Wi-Fi networks could be analyzed. A Spearman test was appropriate for analyzing this correlation due to non-normality of the data with regard to intention to use public Wi-Fi networks (see Table 4). The results of the Spearman test in Table 12 showed a significant and positive correlation between the unrealistic optimism scale and the intention to use public Wi-Fi networks ($r_s = .346$, $p < .01$). This indicates that if people perceived their chance of experiencing negative online events lower compared to others, their intentions to use public Wi-Fi networks were lower too. In other words, people who showed more unrealistic optimism, showed less intention to use public Wi-Fi networks.

Table 12

Spearman Correlation Unrealistic Optimism and Intention to Use Public Wi-Fi Networks regarding Control Group (N = 138)

	1	2
1. Unrealistic Optimism	1	
2. Intention	.346**	1

** $p < .01$

In addition, although the provision of information did not influence unrealistic optimism, its direct influence upon the intention to use public Wi-Fi networks was explored. No outliers were identified within the groups regarding the level of intention. The results of the Mann-Whitney U test showed that the differences in intention between the control group ($M = 38.99$, $SD = 29.618$, $N = 139$) and the experimental group ($M = 41.66$, $SD = 27.286$, $N = 143$) were not significant (Mann-Whitney U = 10706, Standardized Test Statistic = 1.122, $p = .262$) (see Table 13 and Table 14). This means that providing information about risk factors and number of victims did not influence the intention to use public Wi-Fi networks.[2]

[2] Because no difference existed between the groups regarding unrealistic optimism and intention, the following analyses did not make a distinction between the groups. Analyses were conducted with the whole sample,

Table 13

Intention to Use Public Wi-Fi Networks for Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	38.99	41.66
Median	38	35
Mode	0	30
Std. Deviation	29.618	27.286
Skewness	.228	.328
Kurtosis	-1.264	-1.152
Minimum	0	0
Maximum	100	100

Table 14

Mann Whitney U test for Intention to Use Public Wi-Fi Networks (N = 282)

Mann-Whitney U test	
Mann-Whitney U	10706
Test Statistic	10706
Standard Error	684.338
Standardized Test Statistic	1.122
Asymptotic Sig.(2-sided test)	.262

Besides looking at the influence of the provision of information on the intention to use public Wi-Fi networks, an additional analysis was conducted to find out whether the survey itself influenced the intention to use public Wi-Fi networks. Because the same question about intention was asked at the beginning and at the end of the survey, the results of these two measurements could be compared. Table 8 shows that the mean chance that people connect to public Wi-Fi networks before taking the survey was 41.09 per cent (minimum = 0, maximum = 100, *SD* = 27.876). After taking the survey this chance was 40.34 per cent (minimum = 0, maximum = 100, *SD* = 28.440). No outliers were identified. A non-parametric related samples test was conducted due to non-normality of the data of intention to use public Wi-Fi networks

excluding outliers. However, footnotes specify the differences between the two groups. The tables for these analyses can be found in Appendix 2.

both at the beginning and at the end of the survey. The results showed that no significant difference existed with regard to the intention to use public Wi-Fi networks between the first and the second measurement (Test Statistic = 10618.5, Standardized Test Statistic = -1.305, p = .192) (see Table 15). This indicated that the survey itself did not influence the intention to use public Wi-Fi networks.

Another analysis that was conducted concerned the safety of passwords. By means of the website www.testjewachtwoord.nl a safety percentage was provided to the passwords created by the participants. A percentage of 0 meant that a password was very unsafe and a percentage of 100 meant that a password was very safe. An analysis was conducted to find out whether a difference existed between the control group and the experimental group with regard to the creation of safe passwords.

Several respondents indicated that they did not want to create a password. They were not included in the analysis, as well as the respondents who did not fill in the same password twice. After excluding 42 people, 240 respondents were included in the analysis. The lowest safety percentage for password strength was 0 and the highest 100 (M = 37.18, SD = 25.231) (see Table 8). No outliers were identified. The Mann-Whitney U test was used to compare the mean password strength of the control group (M = 37.69, SD = 26.47, N = 116) with the mean password strength of the experimental group (M = 36.45, SD = 24.1, N = 124) (see Table 16). Table 17 shows that no significant difference existed between the two groups regarding password strength (Mann-Whitney U = 7066, Standardized Test Statistic = -.235, p = .815). This means that providing information about risk factors does not influence the creation of safe passwords for using public Wi-Fi networks.

Table 15

Statistical Difference between First and Second Measurement Intention (N = 282)

Wilcoxon Signed Rank Test	
Test Statistic	10618.5
Standard Error	925.354
Standardized Test Statistic	-1.305
Asymptotic Sig.(2-sided test)	.192

Table 16

Password Strength Control Group (N = 116) and Experimental Group (N = 124)

	Control Group	Experimental Group
Mean	37.96	36.45
Std. Error of Mean	2.458	2.164
Median	33	32
Mode	0	0
Std. Deviation	26.47	24.1
Skewness	.636	.655
Kurtosis	-.140	.153
Minimum	0	0
Maximum	100	100

Table 17

Comparing Means of Password Strength between Control Group (N = 116) and Experimental Group (N = 124)

Mann-Whitney U Test	
Mann-Whitney U	7066
Test Statistic	7066
Standard Error	537.135
Standardized Test Statistic	-.235
Asymptotic Sig.(2-sided test)	.815

4.2.4 Analysis Hypothesis 4. With regard to unrealistic optimism, Table 8 shows that after excluding two outliers the minimum overall score for unrealistic optimism in the sample was -32 and the maximum overall score was 18 (M = -6.770, SD = 8.337, N = 280). The maximum total value for perceived controllability was 1050 (very much control over the event) and the minimum was 39 (not very much control over the event) (M = 499.631, SD = 188.710, N = 282) (see Table 8). No outliers were identified within the controllability scale.

The correlation between the perceived controllability scale and the unrealistic optimism scale was moderate and negative (see Table 6). Nevertheless, because the data of the unrealistic optimism scale was not normally distributed (see Table 4), a Spearman test was conducted. The results in Table 18 indicated that the correlation between the scales was negative and significant (r_s = -.315, p < .01). So, when people perceived more controllability

of negative online events, they rated their chances of experiencing negative online events lower compared to others. In other words, people who showed higher perceived controllability of negative online events, also showed more unrealistic optimism. This result was in accordance with hypothesis 4. [3]

Table 18

Spearman's Rho Correlation Perceived Controllability Scale and Unrealistic Optimism Scale (N=280)

	1	2
1. Controllability Scale	1	
2. Unrealistic Optimism Scale	-.315**	1

** $p < .01$ level

4.2.5 Analysis Hypothesis 5. Table 8 shows that the lowest value on the perceived probability scale in the sample was 23 and the highest value was 77 (M = 57.34, SD = 11.50, N = 282). No outliers were identified for the probability scale. The results of the Spearman correlation test showed that the correlation between the probability scale and the unrealistic optimism scale was not statistically significant (r_s = .077, p = .198) (see Table 19).[4] This

[3] The control group showed a minimum overall value on the unrealistic optimism scale of -30 and a maximum of 18 (M = -6.32, SD = 8.305, N = 138) (see Appendix 2, Table 24). The experimental group had a minimum score of -33 and a maximum score of 15 (M = -7.38, SD = 8.62, N = 143). The Cronbach's Alpha for the unrealistic optimism scale for both groups was .869. The Cronbach's Alpha could increase when removing one item from the scale for the control group (see Appendix 2, Table 25). However this resulted in an Alpha not much higher compared to the current Alpha (Cronbach's Alpha if Item Deleted = .871). The maximum value for the control group was 1050 and the minimum was 39 (M = 489.5, SD = 197.886, N = 139) (see Appendix 2, Table 26). The experimental group showed a minimum overall score of 109 and a maximum of 935 (M = 509.48, SD = 179.489, N = 143). No outliers were found. The Cronbach's Alpha for the control and the experimental group were respectively .86 and .831 and would not increase by deleting an item (see Appendix 2, Table 27). Both the control group (r_s = -.308, p < .01) and the experimental group (r_s = -.313, p < .01) showed a negative relationship between the unrealistic optimism scale and the perceived controllability scale (see Appendix 2, Table 28).

[4] On the probability scale, the control group showed a minimum score of 23 and a maximum of 77 (M = 58.7, SD = 11.273, N = 139). The experimental group had a minimum score of 28 and a maximum of 77 (M = 56.34, SD = 11. 677, N = 143) (see Appendix 2, Table 29). Two outliers within the control group were removed from the analysis. The Cronbach's Alpha for the control group was .89 and for the experimental group .9. Although deleting an item would increase the Alpha, the item was not excluded, because the Cronbach's Alpha was already high and deleting the item would not result in a big increasement (see Appendix 2, Table 31). For the

means that no significant relationship existed between perceived probability of negative online events in general and unrealistic optimism toward negative online events. Consequently, the results did not support hypothesis 5.

Table 19

Spearman's Rho Correlation between Perceived Probability Scale and Unrealistic Optimism Scale (N=280)

	1	2
1. Perceived probability scale	1	
2. Unrealistic optimism scale	.077	1

4.2.6 Analysis Hypothesis 6. Table 8 reveals that 8 people had no experience with any negative online event. One person indicated to have experience with all events. No outliers were found for the experience scale. The results of the Spearman test showed that a positive significant linear relation existed between the two variables ($r_s = .156, p < .01$) (see Table 20).[5] The participants who rated their chances of experiencing negative online events higher compared to others had more experience with negative online events, meaning that people with more experience showed less unrealistic optimism. Therefore, these results supported hypothesis 6.

Table 20

Spearman's Rho Correlation between Unrealistic Optimism Scale and Experience Scale (N=280)

	1	2
1. Unrealistic optimism scale	1	
2. Experience scale	.156**	1

** $p < .01$

control group and the experimental group the values of the Spearman test were respectively $r_s = .029$, $p = .733$ and $r_s = .181$, $p = .159$ (see Appendix 2, Table 32).

[5] The control group showed a minimum score of 0 and a maximum of 11 (M = 4.68, SD = 2.405, N = 139). The experimental group respectively had the scores 0 and 10 (M = 4.45, SD = 2.109, N = 134) (see Appendix 2, Table 35) . No outliers were found. The control group showed a significant positive relationship between unrealistic optimism and experience ($r_s = .195, p < .05$). However, the experimental group showed no significant relationship ($r_s = .111, p = .189$) (see Appendix 2, Table 36).

4.2.7 Analysis Hypothesis 7. The last hypothesis concerned the correlation between the frequency of internet usage and unrealistic optimism toward negative online events. Campbell et al. (2005) distinguished between low frequency internet users (less than one hour a day) and high frequency internet users (more than one hour a day) based on a split median of the reported hours a day spent online. However, in the current study, only 9 respondents indicated to use the internet for one hour a day. The other 273 participants spent more than one hour a day on the internet. Therefore, to split the group in low and high frequency users appropriate for the current sample, a median split regarding the hours spend online was used, similar to Campbell et al. (2005).

The results showed that the minimum amount of hours spent online was 1 and the maximum amount of hours spent online was 18 (M = 5.59, SD = 2.816) (see Table 8). After excluding two outliers on the frequency variable, the median was 5 hours a day. A new variable was created existing of low frequency users (less than 5 hours a day on the internet) and high frequency users (5 hours or more a day on the internet) by means of a median split (Gaskin, 2013). The low frequency user group existed of 112 participants (40 per cent) and the high frequency user group existed of 168 participants (60 per cent). Following the example of Campbell et al. (2005), a One Way Analysis Of Variance (ANOVA) was conducted to find out whether the levels of unrealistic optimism of both groups were significantly different. The results in Table 21 showed that no statistically significant difference existed in level of unrealistic optimism between the low frequency users and the high frequency users ($F(1,276) = .182$, $p = .670$).[6] This means that no support existed that high users had more unrealistic optimism toward negative online events compared to low users. Consequently, the results did not support hypothesis 7.

[6] For the control group the highest amount of hours spend a day on the internet was 14 and the lowers amount was 1 (see Appendix 2, Table 39). For the experimental group the minimum and maximum hours were 1 and 18. The means were respectively, 5.64 and 5.54. After excluding the outliers from the analysis, the results showed no statistically significant difference between the low users and the high users of the control group ($F(1,134) = .051$, $p = .822$) or the experimental group ($F(1,139) = .049$, $p = .824$) (see Appendix 2, Table 40).

Table 21

One Way ANOVA for Low and High Users of the Internet (N = 278)

	Sum of Squares	df	Mean Square	*F*	Sig.
Between groups	12.463	1	12.463	.182	.670
Within groups	18929.753	276	68.586		
Total	18942.216	277			

Note. df = Degrees of Freedom, *F* = *F*-ratio (statistical test used for ANOVA)

4.3 Additional Analyses

4.3.1 Question 1. In addition to the hypotheses, two exploratory questions were formulated. The first question asked whether a relationship existed between perceived severity of negative online events and unrealistic optimism toward negative online events. Table 8 shows that the lowest score in the sample for perceived severity was 138 (meaning that negative online events were not perceived as very severe) and the highest score was 1100 (meaning that negative online events were perceived as very severe) (M = 770.62, SD = 160.77, N = 282). One outlier was identified and subsequently excluded from the following analysis. The results of the Spearman correlation in Table 22 revealed that a significant negative correlation existed between the two variables (r_s = -.150, $p < .05$).[7] This indicated that people with a higher perceived severity of negative online events, indicated that they were less likely compared to others to experience negative online events. In short, people who showed higher levels of perceived severity also showed higher levels of unrealistic optimism.

[7] The minimum value on the severity scale for the control group was 138 and the maximum value was 1100 (M = 771.439, SD = 177.636, N = 139) (see Appendix 2, Table 42). For the experimental group these values were respectively 425 and 1075 (M = 769.818, SD = 143.119, N = 143). One outlier on the severity scale for the control group was excluded from the analysis. The Cronbach's Alpha for the control group was .878 and for the experimental group .851. For both groups, the Cronbach's Alpha would not increase after deleting a value (see Appendix 2, Table 43). The results of the Spearman test showed that a negative significant correlation existed between unrealistic optimism of the control group and perceived severity of the control group (r_s = -.249, $p <$ .01). No significant relationship was found for the experimental group (r_s = -.053, p = .526) (see Appendix 2, Table 44).

Table 22

Spearman's Rho Correlation Perceived Severity Scale and Unrealistic Optimism Scale (N=279)

	1	2
1. Unrealistic optimism scale	1	
2. Perceived severity scale	-.150*	1

* $p < .05$

4.3.2 Question 2. The second question asked whether people with self-protective measures showed different levels of unrealistic optimism compared to people without such measures. Of the participants, 20 people used no measures and 262 respondents indicated to use at least one self-protective measure. In order to compare the means of the two groups while the assumption of normality for the unrealistic optimism scale was not met, a Mann-Whitney U test was conducted (Field, 2013). Table 23 shows that the difference between the groups was significant (Mann-Whitney U = 1778.5, Standardized Test Statistic = -2.396, $p < .05$). The group with self-protective measures (M = -7.32, Mdn = -6, SD = 8.540) indicated to be less likely compared to others to experience negative online events than the group who adopted no measures (M = -2.2, Mdn = -2.5, SD = 8.069) (see Table 24). This means that the group whith self-protective measures showed more unrealistic optimism than the group without self-protective measures.[8]

[8] Both the control group and the experimental group showed a minimum amount of 0 protective measures and a maximum amount of 6. In addition, in the control group were 12 people without measures and 127 people who had at least one measure (see Appendix 2, Table 48). The experimental group existed of 8 people with no measures and 135 people with at least one measure. The control group did not show a significant difference between the groups with self-protective measures (M = -6.5, SD = 8.423, N = 126) and without measures (M = -4.42, SD = 6.973, N = 12) (Mann-Whitney U = 654, Standardized Test Statistic = -.772, p = .44) (see Appendix 2, Table 49). The experimental group showed that people with measures (M = -7.7, SD = 8.108, N = 134) were more unrealistic optimistic than people without measures (M = 1.13, SD = 8.903, N = 8) (Mann-Whitney U = 254, Standardized Test Statistic = -2.498, $p < .05$).

Table 23

Difference in Unrealistic Optimism between a Group with Self-Protective Measures (N = 262) and a Group without Self-Protective Measures (N = 20)

Mann-Whitney U test	
Mann-Whitney U	1778.5*
Test Statistic	1778.5
Standard Error	351.224
Standardized Test Statistic	-2.396
Asymptotic Sig.(2-sided test)	.017

* $p < .05$

Table 24

Unrealistic Optimism of Group without Measures (N = 20) and Group with Measures (N = 262)

	Self-protective measures	
	Without measures	With measures
Mean	-2.2	-7.32
Median	-2.5	-6
Mode	0	0
Std. Deviation	8.069	8.540
Skewness	.107	-.450
Kurtosis	.665	.470
Minimum	-20	-33
Maximum	15	18

In addition to exploring the difference between people with self-protective measures and people without self-protective measures, a median split was conducted in order to analyze if people with a few or a lot of measures had a different level of unrealistic optimism. Because the median was 2, all values of 2 and higher were transformed to the group with a lot of measures (N = 207), and all cases with a value of 1 or lower were considered to be the group with a few measures (N = 75). The results of the Mann-Whitney U test showed that the difference in unrealistic optimism between people with a few measures (M = -4.33, Mdn = -3, SD = 7.495) and people with many measures (M = -7.90, Mdn = -7, SD = 8.785) was

significant (Mann-Whitney U = 5966, Standardized Test Statistic = -2.972, $p < .01$) (see Table 25 and Table 26).[9] People with more measures showed more unrealistic optimism compared to people with less measures.

Table 25

Unrealistic Optimism of Group with Few Measures (N = 75) and Group with Many Measures (N = 207)

	Self-protective measures	
	Few measures	Many measures
Mean	-4.33	-7.90
Median	-3	-7
Mode	-8	-6
Std. Deviation	7.495	8.785
Skewness	-.054	-.430
Kurtosis	.121	.437
Minimum	-21	-33
Maximum	15	18

Table 26

Results of Mann-Whitney U Test when Comparing Group with Few Measures (N = 75) and Group with Many Measures (N = 207)

Mann-Whitney U Test	
Mann-Whitney U	5966**
Test Statistic	5966
Standard Error	604.553
Standardized Test Statistic	-2.972
Asymptotic Sig.(2-sided test)	.003

** $p < .01$

[9] The control group showed no significant difference with respect to unrealistic optimism levels between groups with a lot of protective measures (M = -7.14, SD = 8.518, N = 98) and with a few protective measures (M = -4.3, SD = 7.481, N = 40) (Mann-Whitney U = 1561, Standardized Test Statistic = -1.875, p = .061). However, the experimental group did show a significant difference between people with a lot of self-protective measures (M = -8.13, SD = 8.434, N = 107) and people with a few self-protective measures (M = -4.37, SD = 7.62, N = 35) (Mann-Whitney U = 1427.5, Standardized Test Statistic = -2.109, $p < .05$) (see Appendix 2, Table 53).

4.3.3 Additional Exploratory Analyses. Further analyses were conducted to find out more about the difference in intention to use public Wi-Fi networks between people who did show unrealistic optimism and people who did not show unrealistic optimism. In order to find out whether people with or without unrealistic optimism showed different levels of intention the group was split in people who showed unrealistic optimism (*M* = -9.64, *SD* = 6.592, *N* = 216) toward negative online events and people who did not show unrealistic optimism (*M* = 3.24, *SD* = 3.634, *N* = 62) toward negative online events (see Table 27).

Table 27

Descriptive Group with Unrealistic Optimism and Group Without Unrealistic Optimism[a]

	With unrealistic optimism	Without unrealistic optimism
N	219(216)	63(62)
Mean	-9.95(-9.64)	3.48(3.24)
Median	-8(-8)	2(2)
Mode	-8(-8)	0(0)
Std. Deviation	7.075(6.592)	4.055(3.634)
Skewness	-1.018(-.845)	1.529(1.280)
Kurtosis	.773(.216)	2.212(1.026)
Minimum	-33(-30)	0(0)
Maximum	-1(-1)	18(15)

[a]The values in parentheses are the values after excluding the outliers.

Three outliers were identified in the group who showed no unrealistic optimism, whereas one was found in the group who did show unrealistic optimism. These values were excluded from the analysis. Due to very weak or no linearity (see Table 6) and non-normality of intention to use public Wi-Fi networks (see Table 4), a non-parametric test was conducted to find out whether the difference between the groups regarding intention to use public Wi-Fi networks was significant. The Mann-Whitney U Test showed a significant difference between the two groups (Mann-Whitney U = 8334.5, Standardized Test Statistic = 2.938, $p < .01$) (see Table 28). The group with unrealistic optimism reported a significantly lower intention to use public Wi-Fi networks (*M* = 38.02, *Mdn* = 30.5, *N* = 216) compared to the group that showed no unrealistic optimism (*M* = 49.19, *Mdn* = 49.19, *N* = 62) (see Table 29). The group with unrealistic optimism showed a mean chance of 38 per cent to connect to public Wi-Fi networks. The group without unrealistic optimism showed a mean chance of 49 per cent to

use public Wi-Fi networks. In short, the results indicated that people who showed unrealistic optimism had less intention to use public Wi-Fi networks compared to people without unrealistic optimism.

Table 28

Comparing the Mean Level of Intentions between the Group with Unrealistic Optimism (N=216) and the Group without Unrealistic Optimism (N=62)

Mann-Whitney U test	
Mann-Whitney U	8334.5**
Test Statistic	8334.5
Standard Error	557.74
Standardized Test Statistic	2.938
Asymptotic Sig.(2-sided test)	.003

** $p < .01$

Table 29

Descriptive of Intention to Use Public Wi-Fi Networks of Group with Unrealistic Optimism (N = 216) and without Unrealistic Optimism (N = 62)

	With Unrealistic Optimism	Without Unrealistic Optimism
Mean	38.02	49.19
Median	30.5	47
Mode	50	30
Std. Deviation	28.537	26.905
Skewness	.318	.114
Kurtosis	-1.209	-1.144
Minimum	0	1
Maximum	100	100

A regression analysis was conducted in order to control the relationship between unrealistic optimism and intention to use public Wi-Fi networks for personal characteristics and event related moderators. Because the assumption of normality regarding intention to use public Wi-Fi networks was violated, no linear regression analysis could be applied. Therefore, a logistic regression analysis was conducted. The dependent continuous variable (intention to use public Wi-Fi networks) was transformed into a categorial variable by means of the split

median method. This resulted in a group with low intention to use public Wi-Fi networks (*M* = 15.24, *Mdn* = 15, *N* = 139) and a group with high intentions to use public Wi-Fi networks (*M* = 64.74, *Mdn* = 66, *N* = 143) (see Table 30). No outliers were found within the groups for intention, so all values were included in the analyses.

Table 30

Differences in Intention to Use Public Wi-Fi Networks between Low Intention Group (N=139) and High Intention Group (N=143)

	Low intention group	High intention group
Mean	15.24	64.74
Median	15	66
Mode	30	50
Std. Deviation	10.576	16.606
Skewness	.162	.084
Kurtosis	-1.332	-1.033
Minimum	0	35
Maximum	34	100

Before conducting the analysis, the variable about education level was transformed. This variable existed of 14 categories. Some categories counted a low amount of participants. To reduce the number of categories, the 14 categories were combined into lower education (existing of none, basisschool, VMBO, HAVO, VWO, MBO), Bachelor education (existing of HBO propedeuse, HBO bachelor, propedeuse University, and Bachelor University), and Master education (existing of Master HBO, Master University, Post-Master University, and PhD). These categories were derived from the Central Bureau Statistics (CBS) (n.d.). Although CBS formed the category ‘unknown’, this category was not included in the current study because no unknown education levels were identified in the sample. Furthermore, CBS (n.d.) distinguished between lower and higher years in high school. This difference could not be made in the current study because this was not measured. Therefore, these two categories of CBS were combined into the category lower education. An advantage of this division was that by combining the group this way, more respondents would be in each category which made the groups more even. The group existing of people who had lower education existed of 64 respondents (22.7 per cent), the bachelor education level existed of 160 respondents (56.7 per cent), and in the master category were 58 people (20.6 per cent).

After transforming the intention variable and education level variable, a logistic regression analysis was conducted to explore the relationship between intention to use public Wi-Fi networks and unrealistic optimism compared for gender, age, level of education, hours spend online a day, self-protective measures, and the event related moderators. The dependent variable was intention to use public Wi-Fi networks with two categories, namely low and high intention. The independent continuous variable was unrealistic optimism. The control variables were gender (categorial variable), age (continuous variable), education level (categorial variable), perceived probability of negative online events (continuous variable), perceived controllability of negative online events (continuous variable), perceived severity of negative online events (continuous variable), self-protective measures (categorial variable), and frequency of using the internet (continuous variable). Outliers were identified for the variables unrealistic optimism scale, age, perceived severity scale, and frequency of using the internet, and excluded from the analysis.

The goodness of fit test in Table 31 showed that the model with only unrealistic optimism was significant ($\chi^2(1) = 17.3$, $p < .01$). The Hosmer and Lemeshow Test (see Table 31) also supported the goodness of fit for the model ($\chi^2(8) = 3.412$, $p = .906$). The Cox & Snell R Square and the Nagelkerke R Square indicated that between the 6.1 per cent and the 8.1 per cent of the variability in model 1 was explained by unrealistic optimism (see Table 31). The classification table (see Table 32) revealed that model 1 correctly identified 60.4 per cent of the cases, while the model without the variables predicted 51.3 per cent of the cases correctly. Overall, the logistic regression analysis showed that the unrealistic optimism scale was a positive and significant predictor for intention to use public Wi-Fi networks ($B(1) = .064$, $\text{Exp}(B) = 1.067$, $p < .01$). This means that when people indicated that they were more likely compared to others to experience negative online events, they also showed more intention to use public Wi-Fi networks. Model 1 confirmed that people with less unrealistic optimism were more likely to intent to use public Wi-Fi networks, like was revealed by previous analyses.

Table 31

Logistic Regression Model (N = 275)[a]

	Model 1				Model 2			
	B	Exp(*B*)	S.E.	Sig.	*B*	Exp(*B*)	S.E.	Sig.
Constant	0.472**	1.603	.163	.004	0.455	1.576	1.039	.661
Unrealistic optimism scale	0.064**	1.067	.016	.000	0.071**	1.074	0.021	.001
Gender (1 = male)					-0.075	0.928	0.294	.799
Age					-0.022	0.978	0.012	.070
Education (master)								.021
Education (1 = lower education)					1.217**	3.375	0.440	.006
Education (2 = bachelor)					0.722*	2.059	0.369	.050
Probability scale					-0.043**	0.958	0.013	.001
Controllability scale					0.000	1.000	0.001	.712
Severity scale					0.003**	1.003	0.001	.002
Self-protective measures (1 = no measures)					1.004	2.730	0.681	.140
Frequency internet use					-0.008	0.992	0.053	.876
Group (1 = control group)					-0.037	0.964	0.271	.893
Experience (1 = no experience)					1.109	3.031	0.890	.213
Goodness of fit χ^2	17.300**				56.146**			
Hosmer and Lemeshow test χ^2	3.412				9.258			
Cox & Snell R Square	.061				.185			
Nagelerke pseudo R^2	.081				.246			

Note. S.E. = Standard Error

[a]The confidence interval for this analysis was 95 per cent.

*$p \leq .05$. ** $p < .01$

Table 32

Correctly Classified Cases with Unrealistic Optimism (N = 275)

	Predicted		
Observed	Low intention	High intention	% Correct
Model without predictors			
Low intention	0	134	0
High intention	0	141	100
Overall percentage			51.3
Model 1			
Low intention	71	63	53
High intention	46	95	67.4
Overall Percentage			60.4
Model 2			
Low intention	84	50	62.7
High intention	44	97	68.8
Overall percentage			65.8

In the second model, the control variables were added (see Table 31). The omnibus tests of model coefficients showed that the model was a good fit ($\chi^2(12) = 56.146$, $p < .01$). This was supported by the Hosmer and Lemeshow Test ($\chi^2(8) = 9.258$, $p = .321$) (see Table 31). According to the Cox & Snell R Square and the Nagelkerke R Square, between the 18.5 per cent and 24.6 per cent of the variability in the model was explained by the included variables (see Table 31), which was better compared to the previous model where only unrealistic optimism was included in the model. The model including the control variables showed that it could correctly identify 65.8 per cent of the cases (see Table 32).

Table 31 also revealed which variables in model 2 significantly contributed to the model. The variables that contributed to the model were unrealistic optimism, level of education, perceived probability of negative online events, and perceived severity of negative online events. Unrealistic optimism was still significant in this model including control variables ($B(1) = .071$, $\text{Exp}(B) = 1.074$, $p < .01$). With regard to level of education, both lower education ($B(1) = 1.217$, $\text{Exp}(B) = 3.375$, $p < .01$) and bachelor ($B(1) = .722$, $\text{Exp}(B) = 2.059$, $p < .05$) differed significantly and positively from master education. This means that people who had a lower or bachelor education showed a higher intention to use public Wi-Fi networks compared to people who had a master's degree or higher. The perceived probability

scale showed a negative *B* value (*B*(1) = -.043, Exp(*B*) = .958, $p < .01$) indicating that respondents who reported a higher perceived probability were likely to report a lower intention to use public Wi-Fi networks. With regard to perceived severity of negative online events, the results revealed that respondents who reported a higher perceived severity would be more likely to report more intention to use public Wi-Fi networks (*B*(1) = .003, Exp(*B*) = 1.003, $p < .01$). The variables that did not significantly contribute to the model were gender (*B*(1) = -.075, Exp(*B*) = .928, $p = .799$), age (*B*(1) = -.022, Exp(*B*) = .978, $p = .07$), perceived controllability of negative online events (*B*(1) = .000, Exp(*B*) = 1.000, $p = .712$), adopting self-protective measures (*B*(1) = 1.004, Exp(*B*) = 2.730, $p = .140$), frequency of internet use (*B*(1) = -.008, Exp(*B*) = .992, $p = .876$), experimental or control group (*B*(1) = -.37, Exp(*B*) = .964, $p = .893$), and experience with negative online events (*B*(1) = 1.109, Exp(*B*) = 3.031, $p = .213$).

Overall, the results showed that perceived severity was positively related to the intention to use public Wi-Fi networks. Unrealistic optimism, level of education, and perceived probability of negative online events were negatively related to the intention to use public Wi-Fi networks. In addition, even after controlling for the control variables, people who showed more intention to use public Wi-Fi networks showed less unrealistic optimism.

5. Discussion

That using public Wi-Fi networks can lead to cybersecurity risks is becoming general knowledge (Sombatruang et al., 2018). However, people continue to connect to such networks, possibly because they misjudge the risks as a consequence of unrealistic optimism. While unrealistic optimism has been researched extensively, a gap exists in the academic literature regarding the relationship between this human bias and cyber-related behavior (ENISA, 2018; Nurse et al., 2015; Pfleeger & Caputo, 2012). Therefore, the current study has combined the fields of cybersecurity and psychology in order to explain why people continue potentially risky online behavior. The central research question in this study was: '*Does unrealistic optimism about negative online events influence intentions to use public Wi-Fi networks?'*

In order to answer this question, the research focused on several goals. First, the study looked whether unrealistic optimism concerning negative online events existed. Secondly, by means of an experimental design, attempts at reducing such unrealistic optimism were made by providing additional information about risk factors to the experimental group. Moreover, the influence of unrealistic optimism upon the intention to use public Wi-Fi networks was

explored. In addition, the relationships between several event related moderators and unrealistic optimism were analyzed. Furthermore, several other factors, like age, level of education, gender, frequency of using the internet, and adopting self-protective measures, were analyzed to find out whether they were correlated to the intention to use public Wi-Fi networks.

As was expected based on previous research, the results revealed that unrealistic optimism existed with regard to negative online events. However, the provision of information did not lead to an increase or a decrease of unrealistic optimism. Therefore, no conclusion could be drawn about the influence of unrealistic optimism on the intention to use public Wi-Fi networks. Nevertheless, a significant correlation was found between these variables. Respondents who showed more unrealistic optimism showed less intention to use public Wi-Fi networks. This result remained after controlling for event related moderators and personal characteristics. The study further revealed that people with a higher level of education showed less intention to use public Wi-Fi networks compared to participants with a lower level of education. Additionally, people who thought that negative online events were less likely to occur, showed more intention to use public Wi-Fi networks. When people perceived negative online events as more severe, they showed more intention to use public Wi-Fi networks.

Further analyses showed that the provision of information did not directly influence the intention to use public Wi-Fi networks, nor the creation of safe passwords. Moreover, the survey itself had no effect on the intention to use public Wi-Fi networks. In short, this study proved that providing information about risk factors of negative online events did not lead to a change in unrealistic optimism, intention to use public Wi-Fi networks, nor creation of safer passwords. It can therefore be assumed that the provision of information is not effective when trying to change unrealistic optimism or behavioral intentions. This result can be taken into account when developing policy focusing on changing unsafe cybersecurity related behavior.

Besides the influence of unrealistic optimism on intentions, the current study also focused on the existence of moderators that had been proven to influence unrealistic optimism, in order to control for their influence. In accordance with previous studies and hypotheses based thereon, the results revealed that unrealistic optimism was higher when people perceived that they had more control over negative online events. Therefore, the finding provides evidence for the theory that people think they are less likely than others to experience a negative event when they feel they are in control of a situation. This supports the idea that the feeling of being in control leads to feeling less at risk (Cho et al., 2010).

Furthermore, people who had experience with negative online events showed less unrealistic optimism, which was also expected. An explanation for this result is that people with experience have more awareness about the risks and the negative online events (Barnoy et al., 2003). Having experience can lead to a different risk perception and judgement of the likelihood of experiencing a negative online event in comparison with people who have never experienced such an event. In addition, the findings contributed to a better understanding of the relationship between unrealistic optimism and perceived severity of negative online events. More specifically, the results demonstrated that unrealistic optimism was higher when events were considered as more severe.

Moreover, the results provided more insight into the relationship between unrealistic optimism and the adoption of self-protective measures. The outcomes indicated that people with more self-protective measures showed more unrealistic optimism compared to people who had no, or less, self-protective measures. Consequently, this result might support the theory that people with self-protective measures think they are less at risk to experience negative online events compared to others when connecting to public Wi-Fi networks due to their measures. Their optimism might be realistic (Ferrer et al., 2012).

Nevertheless, an important note has to be made with regard to this assumption. The vast majority of the respondents indicated to have at least one self-protective measure. If these numbers are generalizable to the wider population, it means that most individuals have adopted measures to protect themselves from cybersecurity risks. If they all think their chance is lower compared to others to experience negative online events, unrealistic optimism is still present. They might not only think they are less likely than others to experience these events because they have measures themselves, but also because they might neglect that others have adopted measures. However, to whom respondents compare themselves and whether they are aware of the measures of others is a blind spot. This can be an interesting topic for further research. Also, additional studies could reveal whether the majority of people indeed have self-protective measures. If it appears that the majority adopted self-protective measures, than the optimism in the sample might be unrealistic. However, if most respondents in this sample have measures, but most individuals in the society have not, than the optimism in this sample might be realistic.

Although some results gave new insides or were in correspondence with previous studies, other results showed contradicting findings. While the expectations about unrealistic optimism were based on previous research, the current study revealed some unexpected results. For instance, contrary to the outcomes of the study by Campbell et al. (2005), the

results of the current study revealed that unrealistic optimism existed for website tracking, violation of email privacy, password theft, being harassed online, and getting a virus. In addition, results from the study by Campbell et al. (2005) indicated that people thought they were more likely compared to others to receive spam. However, receiving spam was the only event in the current study that was not significant. The differences between the results can be due to changes over time regarding the use of the internet. At the time of reporting the current findings, the study by Campbell et al. (2005) had been conducted fifteen years ago. Over time, people started to use the internet more frequently and intensively which might have led to different outcomes (Cranor, 2008; Kern, 2004; Öğütçü et al., 2016). However, in general, Campbell et al. (2005) found that people were unrealistically optimistic about negative online events fifteen years ago. The current study has shown that unrealistic optimism is still present in the society nowadays.

Another result that was not in accordance with previous results is the relationship between perceived probability of negative online events and unrealistic optimism. Where the current study showed that no significant relationship existed between these variables, previous studies revealed that a higher perceived probability leads to less unrealistic optimism (Campbell et al., 2005; Hoorens, 1994; Weinstein, 1980). A reason for non-correspondence to the outcomes of the studies by Hoorens (1994) and Weinstein (1980) can be that the current study focused on online events instead of offline events. That the findings regarding perceived probability differ from results retrieved by Campbell et al. (2005) might have to do with the time-related aspect and increased use of the internet previously outlined. Nevertheless, although the relationship was not significant, the correlation was in the expected direction. The more probable negative online events were perceived, the less unrealistic optimism participants showed.

A third unexpected finding concerned the frequency of using the internet. While previous studies found that more frequent usage of the internet led to more unrealistic optimism, this study showed no such result. The expectation of this result was derived from the study by Campbell et al. conducted in 2005 and a study by Miyazaki and Fernandez from 2001. They revealed that people who used the internet more frequently showed reduced levels of fear due to their experience with the internet. However, because the internet is used more intensively, people in general have more experience with the internet. That people increased their internet usage is shown by the fact that most low frequency users in the current sample would have been identified as high frequency users in the study by Campbell et al. (2005). That people in general use the internet more often might result in less differences in

unrealistic optimism between people who use the internet more frequently and people who use the internet less frequently.

In addition, although this study proved that providing information about risk factors was ineffective in order to manipulate unrealistic optimism, the finding was contrary to the findings from Weinstein (1983). A possible explanation is that Weinstein researched offline events while online events were central in the current study. Another difference between the studies is that Weinstein focused on students in his sample. Therefore, he was able to provide risk factors and chance of experiencing the event more specified for people of the same age and gender. This would have been difficult in the current study where no specific group was studied.

Lastly, while results from the current study were in accordance with previous findings with regard to the existence of unrealistic optimism toward negative online events (Campbell et al., 2005; Rutter et al, 1998), no support was found that this increased the intention to use public Wi-Fi networks nor unsafe behavior when using these networks. On the contrary, this study revealed a negative correlation between the two variables. People who showed *less* unrealistic optimism showed *more* intention to use public Wi-Fi networks. A possible explanation can be that people who showed more intention to use public Wi-Fi networks might use these networks more often in real life. If they are aware of the security risks, they know they are more likely compared to others to experience negative online events. Consequently, they are less unrealistically optimistic and show more intention to use public Wi-Fi networks. Future research could focus on this relationship in order to be able to get a better understanding about the causality between the two variables.

Although this study could not explain the intention to use public Wi-Fi networks by means of unrealistic optimism, it is of importance to find out why people continue to use these networks. Further studies could explore other ways to influence unrealistic optimism in order to find out whether it affects the intention to use public Wi-Fi networks. However, if unrealistic optimism is not related to the intention to use public Wi-Fi networks it would be interesting to explore for what alternate reasons people still use public Wi-Fi networks. Qualitative research might provide better insights into the motivations behind this risky behavior. Another topic that needs further clarification is the positive relationship between perceived severity of negative online events and intention to use public Wi-Fi networks. It is unclear why this relationship exists in this direction.

5.1 Limitations

One of the limitations of the current study was that a possible bias existed in the sample, since the majority of the respondents was high educated, and between 20 and 26 years old. This was not representative for the Dutch speaking society. The participants might have a different view on negative online events or other risk perceptions compared to the under-represented groups. Therefore, the results might not be generalizable to lower educated people, and people who are younger than 20 years or older than 26 years.

Secondly, the main focus of this study was on measuring a difference in intentions by manipulating unrealistic optimism. Although intentions can influence behavior, they are not the same. People could have responded to intend to use public Wi-Fi networks in a way that might not represent their actual behavior.

A third limitation concerned the way of measuring unrealistic optimism. The current study asked the respondents directly about their chance of experiencing a negative online event compared to others. However, unrealistic optimism can also be measured indirectly by separately asking respondents to indicate their perceived likelihood that a certain event will happen to them or to their peers. Measuring unrealistic optimism another way can lead to different results, because research revealed that the direct method can result in increased levels of unrealistic optimism (Campbell et al., 2005).

5.2 Policy Recommendations

The study revealed that more perceived probability of negative online events, as well as a higher education level, were related to less intention to use public Wi-Fi networks. Therefore, policy aimed at reducing the use of public Wi-Fi networks can focus on increasing perceived probability of negative online events, for example by means of trainings or workshops about digital safety. These trainings could be integrated within the normal curriculum of high schools. As the study shows, providing information is not enough to influence behavior and intentions. A more active participation of the students might be more efficient when trying to increase cybersecure behavior. These recommendations are focused on reducing the intention to use public Wi-Fi networks. No policy recommendations are provided with regard to changing unrealistic optimism, because it is unclear whether unrealistic optimism toward negative online events contributes to unsafe online behavior.

6. Conclusion

In short, the goal of this study was to explore whether unrealistic optimism influenced the intention to use public Wi-Fi networks. As the usage of public Wi-Fi networks can have significant cybersecurity implications, it is of social importance to find out why people continue using them. This study contributed to the scientific knowledge by proving that unrealistic optimism regarding negative online events is still present in the society, just like fifteen years ago when Campbell et al. (2005) conducted their research. Moreover, providing people with information about risk factors proved to be insufficient in order to reduce unrealistic optimism or the intention to use public Wi-Fi networks. Nevertheless, this study found that a higher level of education and a higher level of perceived probability of negative online events were related to less intention to use public Wi-Fi networks.

Unfortunately, the study was not able to influence the level of unrealistic optimism. Therefore, no conclusion could be drawn about the effect of unrealistic optimism on the intention to use public Wi-Fi networks. However, the study revealed that a negative relationship existed between the concepts. Although proving causality was absent in the study, unrealistic optimism was not. Until more is revealed about this causal relationship, at least one thing is clear with regard to negative online events and cyber security risks: Be careful when connecting to public Wi-Fi networks because negative online events might happen to you.

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8. Appendix

Appendix 1

Survey

What is your gender?

- Man
- Women
- Other

What is your highest completed education?

- None
- Basisschool
- VMBO
- HAVO
- VWO
- MBO
- Propedeuse HBO
- HBO
- HBO master
- Propedeuse Universiteit
- Bachelor Universiteit
- Master Universiteit
- Post-master Universiteit
- PhD

What is your age?

- Open question

How often did you use public Wi-Fi networks before the Corona-period? *(Think about networks in public transport, in hotels, in big companies, at airports etcetera. Some public Wi-Fi networks need a password, for example in restaurants or cafes. Other public Wi-Fi networks ask you to make an account, for example at some airports.)*

- Never

- Rarely
- Occasionally
- Often
- Frequently
- Always

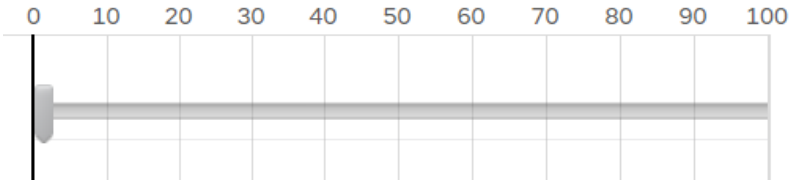
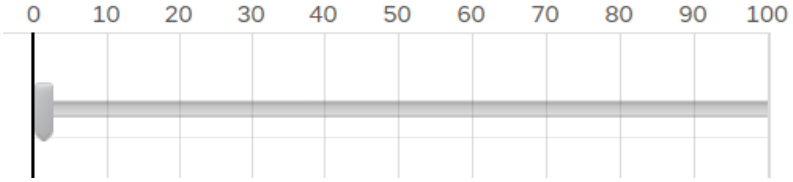
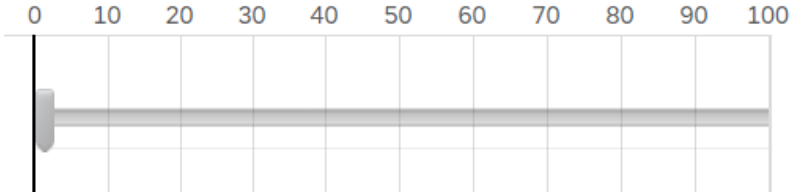
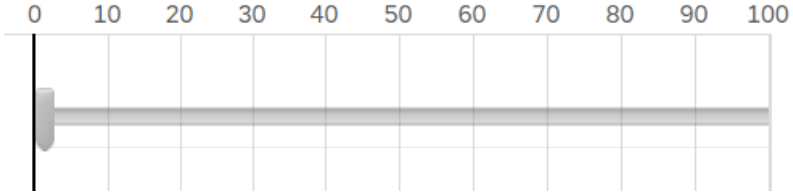
If you were in a public space where public Wi-Fi networks were offered, what is the chance that you would use this network? (Rate the chance from 0% to 100%)

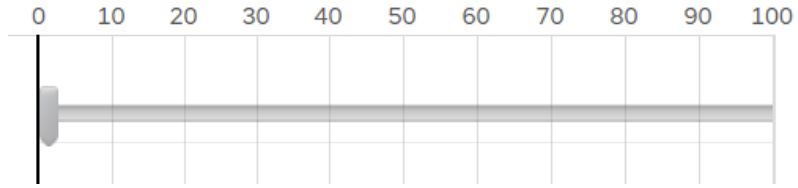
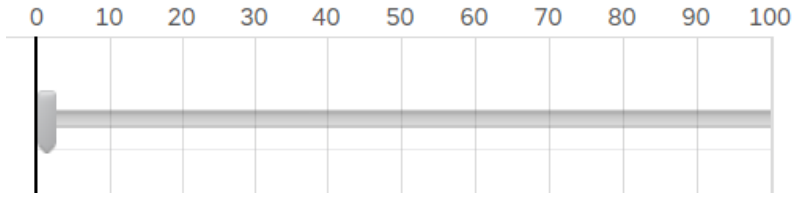
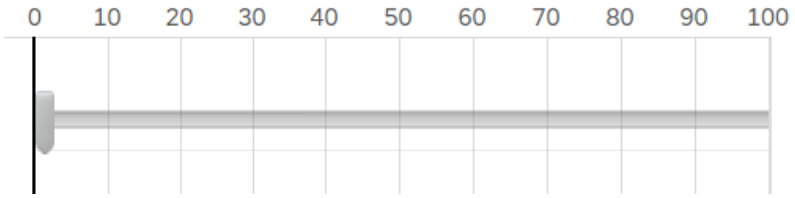
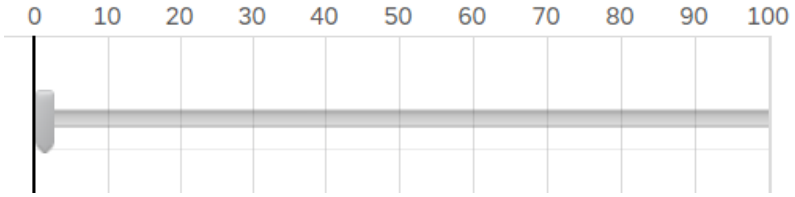
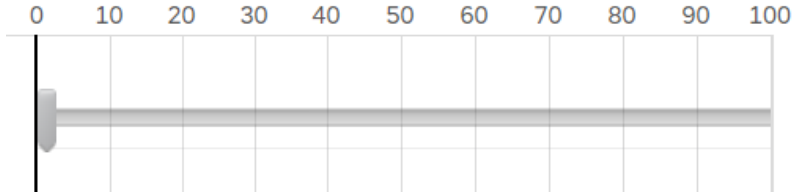
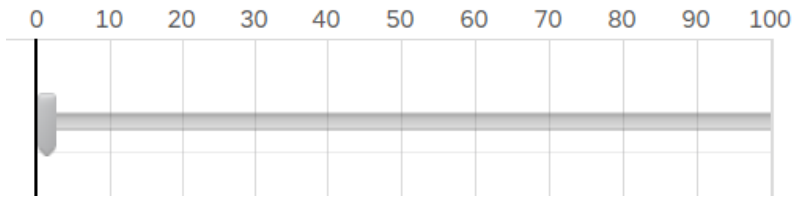
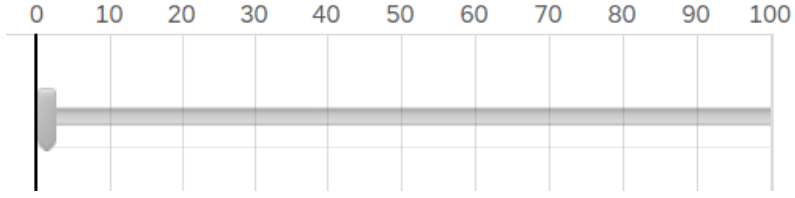
What is the probability that the following online events in general would happen?

	Very unlikely	Unlikely	A little unlikely	Neutral	A little likely	Likely	Very likely
Auction fraud (you bought something online and did already pay, but you did not receive the product)							
Online stalking							
Online ID-theft							
Selling stolen personal information							
Someone has unauthorized access to personal information on a tablet, laptop or mobile phone							
Online harassment (Think about, for example, harassing messages, being bullied, or unwanted sexual messages)							
Password theft							

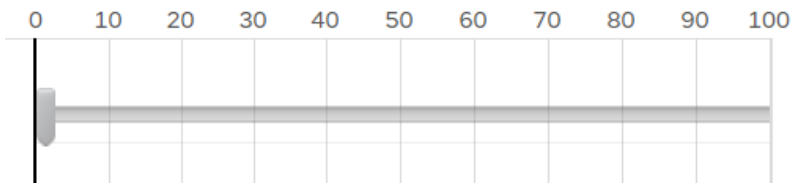
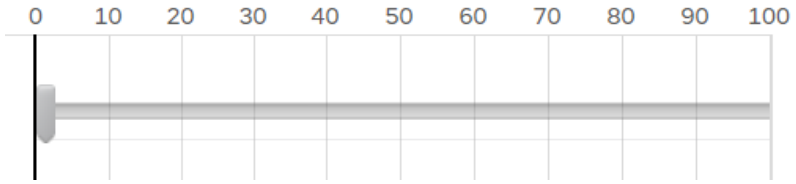
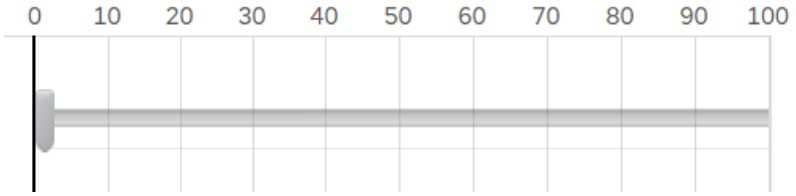
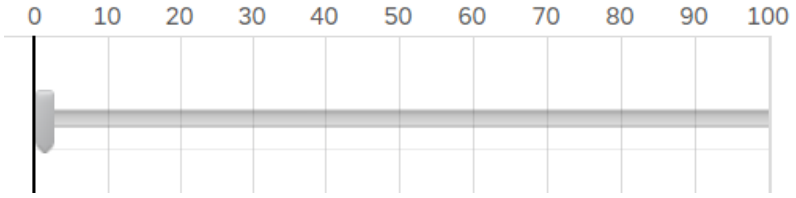
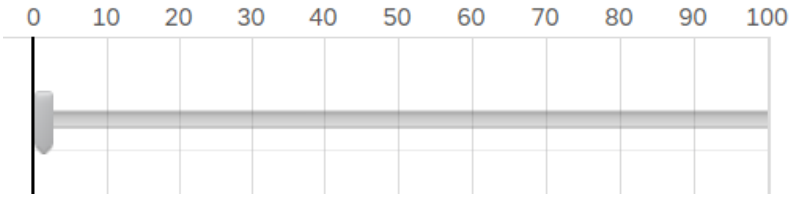
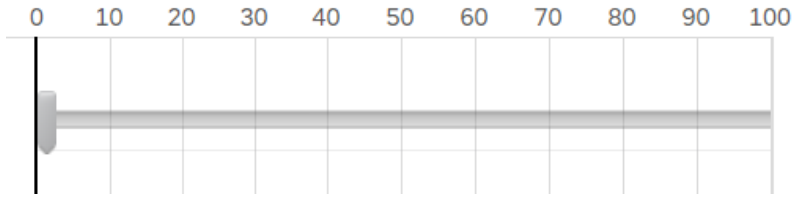
Violation of email privacy							
Website tracking							
Getting a virus on a tablet, laptop or mobile phone							
Getting spam on a tablet, laptop or mobile phone							

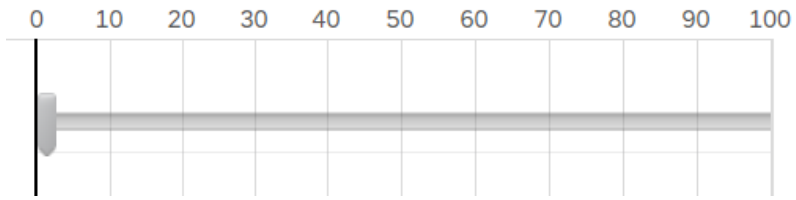
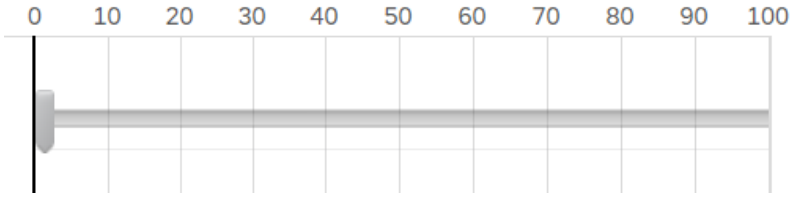
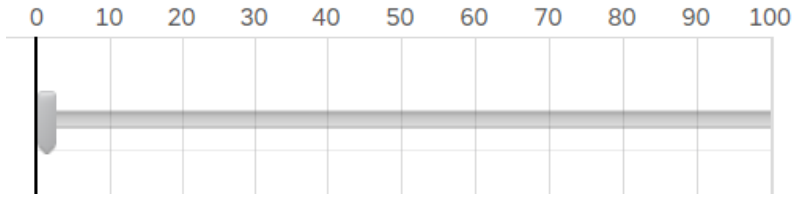
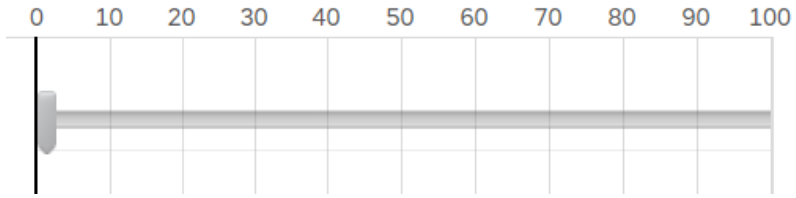
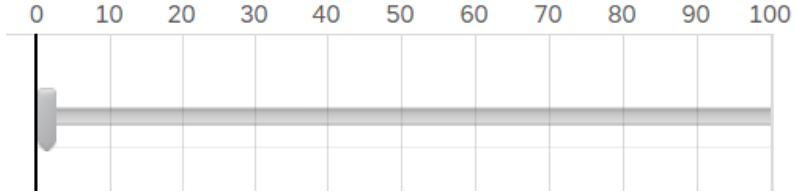
To what extent are you in control over the following events?

	0=Not at all under control 100=Completely under control
Auction fraud	
Online stalking	
Online ID-theft	
Selling stolen personal information	

Someone has unauthorized access to personal information on a tablet, laptop or mobile phone	
Online harassment	
Password theft	
Violation of email privacy	
Website tracking	
Getting a virus on a tablet, laptop or mobile phone	
Getting spam on a tablet, laptop or mobile phone	

How severe are these events according to you?

	0=Not at all severe 100=Very severe
Auction fraud	
Online stalking	
Online ID-theft	
Selling stolen personal information	
Someone has unauthorized access to personal information on a tablet, laptop or mobile phone	
Online harassment	

Password theft	
Violation of email privacy	
Website tracking	
Getting a virus on a tablet, laptop or mobile phone	
Getting spam on a tablet, laptop or mobile phone	

Have you, or someone you know, become a victim of the following events?

	Yes	No
Auction fraud		
Online stalking		
Online ID-theft		
Selling stolen personal information		
Someone has unauthorized access to personal information on a tablet, laptop or mobile phone		
Online harassment		

Password theft		
Violation of email privacy		
Website tracking		
Getting a virus on a tablet, laptop or mobile phone		
Getting spam on a tablet, laptop or mobile phone		

How many hours a day are you using the internet?

- Open question

Estimate the chance that one of the following events will happen to you compared to someone of the same gender and the same age. Compared to someone of the same gender and the same age, the chance that… *(the control group received the same question, but without the risk factors and victim numbers)*

	Much lower	Lower	A little lower	The same	A little higher	Higher	Much higher
I will become victim of auction fraud is… (Each year around 391.500 people become victim in the Netherlands. Risk factors are using the internet, buying online, low self-control/being impulsive, being active at online for a, being a man)							
I am stalked online is… (Each year around 130.500 people become victim in the Netherlands. Risk factors are being stalked offline, previous experience with being stalked online, using the internet, using online social networks, sharing							

personal information online)							
My identity gets stolen is… (Each year around 145.000 people in the Netherlands become victim. Risk factors are using public Wi-Fi networks, sharing personal information online and a high income)							
My personal information will be sold is… (Risk factors are using public Wi-Fi networks, exchanging personal information for discounts, a lot of applications having installed on your phone, not updating applications)							
Someone has unauthorized access to my personal information on a tablet, laptop or mobile phone is… (Each year around 254.000 people in the Netherlands become victim. Risk factors are using public Wi-Fi networks, participate in discussions on internet for a, communicate via profile-websites like Facebook, low self-control/being impulsive, having little knowledge about computers, being youngster, having a lower level of							

education)							
I am being harassed online is… (Each year around 304.500 people become victim in the Netherlands. Risk factors are low self-control/being impulsive, using social media, having friends who harass others, being harassed offline, sharing personal information, harassing others, having a lower level of education, being female, being youngster)							
My passwords are being stolen is… (Each day around 5 million passwords are being stolen worldwide. Risk factors are using public Wi-Fi networks, using the same password for several accounts)							
The privacy of my email is being violated is… (Risk factors are being emailed in the CC and using public Wi-Fi networks)							
Select here: a little lower							
The websites I visit are being tracked is… (Risk factors are accepting cookies, not deleting the cache of your browser, using public Wi-Fi networks)							

I get a virus on my tablet, laptop or mobile phone is… (Each year around 870.000 people become victim in the Netherlands. Risk factors are watching porn, visiting dating sites, a lot (illegal) downloading, playing online games, buying online stuff, committing online crimes, being youngster, being female, using someone else's internet without consent, intimidate people via the internet, low self-control/being impulsive, using public Wi-Fi networks)							
I get spam on a tablet, laptop or mobile phone is… (Risk factors are posting your email address online. Having a virus scanner does not protect against receiving spam)							

Are you using the following measures when using public Wi-Fi networks? Check the box of which apply to you. You can check more than one box.

- I use a VPN
- I only use HTTPS-websites
- I use different passwords for different accounts
- I turn of Wi-Fi if I do not need it anymore
- I do not send sensitive information via public Wi-Fi networks
- I do not use any of the measures
- I do not use public Wi-Fi networks

What is the chance that you will use public Wi-Fi networks if you do not need to enter a password? (Rate the chance from 0% to 100%)

What is the chance that you will use public Wi-Fi networks if you have to create a password? (Rate the chance from 0% to 100%)

Imagine you have to create a password in order to use a public Wi-Fi network, for example in a restaurant or at an airport. Create a password (one that you can remember)

- Open question

Repeat the password you created in the previous question.

- Open question

If you were in a public space where public Wi-Fi networks were offered, what is the chance that you would use this network? (Rate the chance from 0% to 100%)

Appendix 2

Tables

Table 1

Number of Participants (N = 282)

	N	%	Cumulative %
Control group	139	49.3	49.3
Experimental group	143	50.7	100

Table 2

Respondent Characteristics Gender, Level of Education, and Public Wi-Fi Use (N=282)

Characteristic	N	%	Cumulative %
Gender			
Man	120	42.6	42.6
Woman	162	57.4	100
Level of education			
Primary school	2	.7	.7
VMBO	2	.7	1.4
HAVO	11	3.9	5.3
VWO	30	10.6	16
MBO	19	6.7	22.7
Propedeuse HBO	13	4.6	27.3
HBO	57	20.2	47.5
HBO Masters	3	1.1	48.6
Propedeuse University	28	9.9	58.5
Bachelor University	62	22	80.5
Masters University	50	17.7	98.2
Post-Master University	3	1.1	99.3
PhD	2	.7	100
Frequency public Wi-Fi use			
Never	29	10.3	10.3
Rarely	70	24.8	35.1
Occasionally	94	33.3	68.4

Often	41	14.5	83
Frequently	43	15.2	98.2
Always	5	1.8	100

Table 3

Cronbach's Alpha for Created Scales

	Cronbach's Alpha
Unrealistic optimism scale	.863
Perceived controllability scale	.847
Perceived probability scale	.900
Perceived severity scale	.866

Table 4

Reliability Test Unrealistic Optimism Scale (N=280)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Unrealistic optimism auction fraud	-5.51	60.595	.478	.264	.857
Unrealistic optimism online stalking	-5.49	56.846	.579	.532	.850
Unrealistic optimism ID-theft	-5.9	57.113	.644	.523	.846
Unrealistic optimism personal information being sold	-6.36	57.808	.591	.474	.849
Unrealistic optimism	-5.93	56.479	.636	.443	.846

unauthorized access to information					
Unrealistic optimism being harrassed	-5.67	56.773	.574	.519	.851
Unrealistic optimism password theft	-6.55	58.277	.556	.353	.852
Unrealistic optimism violation email privacy	-6.36	56.84	.676	.488	.843
Unrealistic optimism website tracking	-6.92	61.736	.374	.293	.864
Unrealistic optimism getting a virus	-6.08	57.162	.562	.340	.852
Unrealistic optimism receiving spam	-6.9	60.86	.473	.308	.858

Table 5

Reliability Test Perceived Controllability Scale (N=282)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Controllability auction fraud	433.79	31839.14	.417	.281	.842
Controllability online stalking	459.01	29902.97	.506	.435	.836
Controllability ID-theft	451.46	28870.36	.647	.509	.824
Controllability personal information being sold	466.07	29613.76	.571	.432	.831
Controllability unauthorized access to information	447.13	28845.97	.626	.513	.826
Controllability being harrassed	461.04	29506.18	.525	.434	.834
Controllability password theft	453.17	29287.8	.596	.422	.829
Controllability violation email privacy	460.61	29307.75	.654	.468	.825
Controllability website tracking	460.45	30183.56	.407	.248	.846
Controllability getting a virus	441.59	30636.34	.494	.331	.837
Controllability receiving spam	461.98	30702.21	.411	.257	.844

Table 6

Reliability Perceived Probability Scale (N=282)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Probability auction fraud	52.7	108.667	.642	.493	.890
Probability online stalking	52.76	103.778	.724	.614	.885
Probability online ID theft	52.72	105.889	.711	.651	.886
Probability personal information being sold	52.34	106.374	.679	.592	.888
Probability unauthorized access to information	52.46	105.544	.744	.579	.884
Probability being harrassed	52.05	107.77	.674	.536	.888
Probability password theft	52.06	107.712	.769	.610	.883
Probability violation email privacy	52.15	110.853	.660	.505	.889
Probability website tracking	51.02	124.37	.281	.149	.906

Probability getting a virus	52.16	112.597	.589	.435	.893
Probability receiving spam	51	121.811	.43	.316	.900

Table 7

Reliability of the Perceived Severity Scale of Negative Online Events (N=281)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Severity auction fraud	702.62	20767.564	.533	.332	.857
Severity online stalking	694.02	21469.846	.466	.463	.861
Severity online ID theft	684.57	22407.789	.43	.365	.864
Severity personal information being sold	693.47	21069.6	.542	.396	.857
Severity someone has unauthorized access to personal information	693.6	20610.733	.632	.501	.851
Severity online being harassed	699.24	20557.832	.503	.443	.860
Severity password theft	693.3	20710.753	.603	.449	.853
Severity violation email privacy	701.72	19439.633	.737	.615	.842
Severity website tracking	728.75	19220.073	.647	.558	.849

Severity getting a virus	702.89	20318.756	.554	.357	.856
Severity getting spam	734.52	19185.786	.593	.539	.854

Table 8

Normality Test for the Whole Sample Excluding Outliers

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Age (N = 282)	.311**	282	.000
Intention to use public Wi-Fi networks before survey (N = 282)	.116**	282	.000
Hours a day spend online (N = 280)	.157**	282	.000
Intention to use public Wi-Fi networks after survey (N = 282)	.111**	282	.000
Unrealistic optimism scale (N = 280)	.066**	280	.005
Password strength (N = 240)	.111**	240	.000
Perceived controllability scale (N = 282)	.051	282	.072
Perceived probability scale (N = 282)	.067**	282	.004
Experience scale (N = 282)	.141**	282	.000
Perceived severity scale (N = 281)	.036	281	.200

Note. df = Degrees of Freedom

**$p < .01$

Table 9

Normality Test for the Control Group and the Experimental Group Excluding Outliers

	Kolmogorov-Smirnov							
	Control group				Experimental group			
	N	Statistic	df	Sig.	N	Statistic	df	Sig.
Unrealistic optimism scale	138	.107**	138	.001	143	.097**	143	.002
Intention to use public Wi-Fi networks after survey	139	.131**	139	.000	143	.134**	143	.000
Perceived controllability scale	139	.083*	139	.021	143	.060	143	.200
Perceived probability scale	137	.098**	137	.002	143	.062	143	.200
Experience scale	139	.144**	139	.000	143	.136**	143	.000
Perceived severity scale	137	.043	137	.200	143	.039	143	.200

Note. df = Degrees of Freedom

*$p < .05$. ** $p < .01$

Table 10

Correlation Coefficient and Variance between Variables Retrieved from Scatterplot

	R	R^2
Unrealistic optimism and perceived controllability scale (N = 280)	-.355	.126
Unrealistic optimism and perceived probability scale (N = 280)	.077	.006
Unrealistic optimism and perceived severity scale (N = 279)	-.141	.020
Unrealistic optimism and intention to use public Wi-Fi networks (control group, N = 138)	.302	.091
Unrealistic optimism and experience scale (N = 280)	.170	.029
Presence of unrealistic optimism and intention to use public Wi-Fi networks (N = 219)	.255	.065
No presence of unrealistic optimism and intention to use public Wi-Fi networks (N = 63)	.114	.013

Table 11

One Sample T-Test for Unrealistic Optimism for the Individual Negative Online Events for the Control Group (N = 139)

	M	*SD*	*t*	df
Auction fraud	-1.187**	1.053	-13.285**	138
Online stalking	-1.130**	1.244	-10.702**	138
Online ID-theft	-0.820**	1.092	-8.856**	138
Personal information being sold	-0.389**	1.139	-4.021**	138
Someone accessing files	-0.741**	1.315	-6.643**	138
Online harassment	-1.014**	1.257	-9.516**	138
Password theft	-0.309**	1.166	-3.127**	138
Violation email privacy	-0.360**	1.050	-4.041**	138
Website tracking	-0.108**	1.061	-1.199**	138
Receiving virus	-0.547**	1.309	-4.925**	138
Receiving spam	0.094	1.035	1.066	138

Note. *M* = Mean, *SD* = Standard Deviation, *t* = Test Statistic for *t*-test, df = Degrees of Freedom

**$p < .01$

Table 12

One Sample T-Test for Unrealistic Optimism for Individual Negative Online Events (N = 282)

								95% CI	
	M	*SD*	*S.E.M*	*t*	df	Sig. (2-tailed)	*M* difference	Lower	Upper
Control group									
Auction fraud	-1.187	1.053	.089	-13.285**	138	.000	-1.187	-1.364	-1.010
Online stalking	-1.130	1.244	.106	-10.702**	138	.000	-1.130	-1.338	-0.921
Online ID-theft	-0.820	1.092	.093	-8.856**	138	.000	-0.820	-1.003	-0.637
Personal information being sold	-0.389	1.139	.097	-4.021**	138	.000	-0.388	-0.580	-0.198
Someone accessing files	-0.741	1.315	.112	-6.643**	138	.000	-0.741	-0.962	-0.520
Online harassment	-1.014	1.257	.107	-9.516**	138	.000	-1.014	-1.225	-0.804
Password theft	-0.309	1.166	.099	-3.127**	138	.002	-0.309	-0.505	-0.114
Violation email privacy	-0.360	1.050	.089	-4.041**	138	.000	-0.360	-0.536	-0.184
Website trackign	-0.108	1.061	.090	-1.199**	138	.000	-0.108	-0.286	0.070
Receiving virus	-0.547	1.309	.111	-4.925**	138	.000	-0.547	-0.766	-0.327
Receiving spam	0.094	1.035	.088	1.066	138	.289	0.094	-0.080	0.267
Experimental group									
Auction fraud	-1.343	1.056	.088	-15.211**	142	.000	-1.343	-1.517	-1.168
Online stalking	-1.441	1.282	.107	-13.441**	142	.000	-1.441	-1.652	-1.229

Online ID-theft	-0.937	1.206	.101	-9.294**	142	.000	-0.937	-1.136	-0.738
Personal information being sold	-0.462	1.203	.101	-4.587**	142	.000	-0.462	-0.660	-0.263
Someone accessing files	-0.958	1.113	.093	-10.298**	142	.000	-0.958	-1.142	-0.774
Online harassment	-1.203	1.314	.110	-10.948**	142	.000	-1.203	-1.420	-0.986
Password theft	-0.168	1.199	.100	-1.675	142	.096	-0.168	-0.366	0.030
Violation email privacy	-0.497	1.215	.102	-4.885**	142	.000	-0.497	-0.697	-0.296
Website tracking	0.364	1.166	.098	3.729**	142	.000	0.364	0.171	0.556
Receiving virus	-0.860	1.225	.102	-8.394**	142	.000	-0.860	-1.063	-0.658
Receiving spam	0.119	1.084	.091	1.311	142	.192	0.119	-0.060	0.298

Note. *M* = Mean; *S.D.* = Standard Deviation; *S.E.M* = Standard Error of Mean; *t* = Test Statistic for *T*-Test; df = Degrees of Freedom; CI = Confidence Interval.

** $p < .01$.

Table 13

Descriptive Unrealistic Optimism Scale for Control Group and Experimental Group[a]

	Control group	Experimental group
N	139(138)	143
Mean	-6.51(-6.32)	-7.38
Median	-5(-5)	-7
Mode	-3(-3)	-9
Std. Deviation	8.579(8.305)	8.619
Skewness	-.494(-.379)	-.335
Kurtosis	.613(.398)	.510
Minimum	-33(-30)	-33
Maximum	18(18)	15

[a]The values in parentheses are the values after excluding the outlier.

Table 14

Wilcoxon Signed Rank Test Unrealistic Optimism Toward Negative Online Events in General

	Control group	Experimental group
N	138	143
Test Statistic	982.5**	847.5**
Standard Error	425.058	445.079
Standardized Test Statistic	-7.552	-8.106
Asymptotic Sig.(2-sided test)	.000	.000

**$p < .01$

Table 15

Comparing the Mean Level of Unrealistic Optimism between the Control Group (N=138) and the Experimental Group (N=143)

Mann-Whitney U test	
Mann-Whitney U	9016
Test Statistic	9016
Standard Error	680.382
Standardized Test Statistic	-1.251
Asymptotic Sig.(2-sided test)	.211

Table 16

Spearman Correlation Unrealistic Optimism and Intention to Use Public Wi-Fi Networks regarding Control Group (N = 138)

	1	2
1. Unrealistic Optimism	1	
2. Intention	.346**	1

** $p < .01$

Table 17

Intention to Use Public Wi-Fi of Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	38.99	41.66
Median	38	35
Mode	0	30
Std. Deviation	29.618	27.286
Skewness	.228	.328
Kurtosis	-1.264	-1.152
Minimum	0	0
Maximum	100	100

Table 18

Mann Whitney U test for Intention to Use Public Wi-Fi Networks (N = 282)

Mann-Whitney U test	
Mann-Whitney U	10706
Wilcoxon W	21002
Test Statistic	10706
Standard Error	684.338
Standardized Test Statistic	1.122
Asymptotic Sig.(2-sided test)	.262

Table 19

Descriptive Continuous Variables[a]

	Age	Intention after survey	Intention before survey	Password strength	Unrealistic optimism scale	Perceived controllability scale	Perceived probability scale	Experience scale	Frequency	Perceived severity scale
N	282	282	282	240	282(280)	282	282	282	282(280)	282(281)
Mean	30.34	40.34	41.09	37.18	-6.954(-6.77)	499.631	57.340	4.56	5.59(5.51)	770.617(772.868)
Median	24	35	39.5	32.5	-6(-6)	486.5	58	4	5(5)	765.5(766)
Mode	22	50	30	0	0(0)	480	65	3	5(5)	704(704)
SD	14.278	28.44	27.876	25.231	8.595(8.337)	188.710	11.505	2.259	2.816(2.653)	160.77(156.54)
Skewness	1.751	.259	.260	.259	-.410(-.299)	.334	-.449	.327	.925(.619)	-.253(-.081)
Kurtosis	2.604	-1.195	-1.071	-.005	.511(.325)	.254	-.166	-.305	1.418(.105)	.117(-.486)
Min.	18	0	0	0	-33(-32)	39	23	0	1(1)	138(342)
Max.	99	100	100	100	18(18)	1050	77	11	18(14)	1100(1100)

Note. SD = Standard Deviation

[a]The values in parentheses are the values after excluding the outliers.

Table 20

Statistical Difference between First and Second Measurement Intention (N = 282)

Wilcoxon Signed Rank Test	
Test Statistic	10618.5
Standard Error	925.354
Standardized Test Statistic	-1.305
Asymptotic Sig.(2-sided test)	.192

Table 21

Password Strength Control Group (N = 116) and Experimental Group (N = 124)

	Control Group	Experimental Group
Mean	37.96	36.45
Std. Error of Mean	2.458	2.164
Median	33	32
Mode	0	0
Std. Deviation	26.47	24.1
Skewness	.636	.655
Kurtosis	-.140	.153
Minimum	0	0
Maximum	100	100

Table 22

Results Comparing Means of Password Strength between Control Group (N = 116) and Experimental Group (N = 124)

Mann-Whitney U Test	
Mann-Whitney U	7066
Test Statistic	7066
Standard Error	537.135
Standardized Test Statistic	-.235
Asymptotic Sig.(2-sided test)	.815

Table 23

Spearman's Rho Correlation Perceived Controllability Scale and Unrealistic Optimism Scale (N=280)

	1	2
1. Controllability scale	1	
2. Unrealistic optimism scale	-.315**	1

** $p < .01$ level

Table 24

Descriptive Unrealistic Optimism Scale for Control Group and Experimental Group[a]

	Control group	Experimental group
N	139(138)	143
Mean	-6.51(-6.32)	-7.38
Median	-5(-5)	-7
Mode	-3(-3)	-9
Std. Deviation	8.579(8.305)	8.619
Skewness	-.494(-.379)	-.335
Kurtosis	.613(.398)	.510
Minimum	-33(-30)	-33
Maximum	18(18)	15

[a]The values in parentheses are the values after excluding the outliers.

Table 25

Reliability Test Unrealistic Optimism Scale for Control Group (N = 138) and Experimental Group (N = 143)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Control Group					
Unrealistic optimism auction fraud	-5.14	61.351	0.399	0.236	0.869

Unrealistic optimism online stalking	-5.2	55.813	0.629	0.597	0.854
Unrealistic optimism ID-theft	-5.51	57.215	0.649	0.589	0.853
Unrealistic optimism personal information being sold	-5.95	57.654	0.591	0.58	0.857
Unrealistic optimism unauthorized access to information	-5.59	54.506	0.662	0.526	0.851
Unrealistic optimism being harrassed	-5.32	56.992	0.552	0.519	0.86
Unrealistic optimism password theft	-6.03	56.919	0.62	0.564	0.855
Unrealistic optimism violation email privacy	-5.98	57.189	0.69	0.576	0.851
Unrealistic optimism website tracking	-6.23	61.873	0.37	0.34	0.871
Unrealistic optimism	-5.79	54.839	0.649	0.536	0.852

getting a virus					
Unrealistic optimism receiving spam	-6.43	60.904	0.451	0.333	0.866
Experimental Group					
Unrealistic optimism auction fraud	-6.04	63.674	0.563	0.372	0.859
Unrealistic optimism online stalking	-5.94	61.786	0.539	0.514	0.861
Unrealistic optimism ID-theft	-6.45	60.657	0.648	0.52	0.852
Unrealistic optimism personal information being sold	-6.92	61.41	0.606	0.498	0.856
Unrealistic optimism unauthorized access to information	-6.43	62.105	0.624	0.503	0.855
Unrealistic optimism being harrassed	-6.18	60.347	0.598	0.569	0.856
Unrealistic optimism password theft	-7.22	62.748	0.532	0.322	0.861
Unrealistic optimism	-6.89	60.016	0.679	0.534	0.85

violation email privacy					
Unrealistic optimism website tracking	-7.75	64.204	0.466	0.399	0.865
Unrealistic optimism getting a virus	-6.52	63.153	0.494	0.315	0.864
Unrealistic optimism receiving spam	-7.5	63.998	0.525	0.345	0.861

Table 26

Descriptive Controllability Scale Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	489.5	509.48
Median	485	491
Mode	480	452
Std. Deviation	197.886	179.489
Skewness	0.389	0.303
Std. Error of Skewness	0.206	0.203
Kurtosis	0.584	-0.178
Std. Error of Kurtosis	0.408	0.403
Minimum	39	109
Maximum	1050	935

Table 27

Item-Total Statistics Controllability Scale Control Group (N = 139) and Experimental Group (N = 143)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Control Group					
Controllability auction fraud	424.22	34775.54	0.436	0.317	0.856
Controllability online stalking	448.86	33378.91	0.517	0.448	0.851
Controllability ID-theft	442.05	31978.73	0.645	0.551	0.841
Controllability personal information being sold	457.45	32939.47	0.571	0.454	0.847
Controllability unauthorized access to information	439.27	31664.62	0.632	0.525	0.842
Controllability being harrassed	449.8	32729.39	0.518	0.462	0.851
Controllability password theft	444.4	32112.15	0.619	0.467	0.843
Controllability violation email privacy	451.16	31759.37	0.677	0.508	0.839
Controllability website tracking	451.86	33190.77	0.444	0.307	0.858
Controllability	432.72	32743.22	0.582	0.424	0.846

getting a virus					
Controllability receiving spam	453.25	33691.65	0.452	0.282	0.856
Experimental Group					
Controllability auction fraud	443.1	29032.84	0.393	0.302	0.825
Controllability online stalking	468.87	26536.62	0.501	0.436	0.817
Controllability ID-theft	460.62	25881.79	0.648	0.532	0.804
Controllability personal information being sold	474.45	26446.8	0.571	0.441	0.811
Controllability unauthorized access to information	454.78	26190.46	0.617	0.518	0.806
Controllability being harrassed	471.97	26337.65	0.543	0.471	0.813
Controllability password theft	461.7	26600.63	0.569	0.4	0.811
Controllability violation email privacy	469.79	26959.27	0.625	0.46	0.808
Controllability website tracking	468.8	27331.16	0.368	0.217	0.832
Controllability getting a virus	450.22	28652.59	0.386	0.271	0.826
Controllability receiving spam	470.46	27866.18	0.367	0.264	0.83

Table 28

Spearman's Rho Correlation Perceived Controllability and Unrealistic Optimism for the Control Group (N = 138) and the Experimental Group (N = 142)

	1	2
Control group		
1. Controllability scale	1	
2. Unrealistic optimism scale	-.308**	1
Experimental group		
1. Controllability scale	1	
2. Unrealistic optimism scale	-.313**	1

** $p < .01$ level

Table 29

Spearman's Rho Correlation between Perceived Probability Scale and Unrealistic Optimism Scale (N=280)

	1	2
1. Perceived probability scale	1	
2. Unrealistic optimism scale	.077	1

Table 30

Descriptive Probability Scale Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	58.37	56.34
Median	60	56
Mode	65	43a
Std. Deviation	11.273	11.677
Skewness	-0.582	-0.33
Std. Error of Skewness	0.206	0.203
Kurtosis	0.121	-0.317
Std. Error of Kurtosis	0.408	0.403
Minimum	23	28
Maximum	77	77

Table 31

Item-Total Statistics Probability Scale for Control Group (N = 137) and Experimental Group (N = 143)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Control Group					
Probability auction fraud	53.88	95.589	0.6	0.47	0.882
Probability online stalking	53.69	94.129	0.657	0.561	0.878
Probability ID-theft	53.85	94.537	0.651	0.621	0.878
Probability personal information being sold	53.28	95.393	0.626	0.559	0.88
Probability unauthorized access to information	53.52	94.384	0.713	0.595	0.874
Probability being harrassed	52.99	96.419	0.679	0.54	0.877
Probability password theft	53.05	95.005	0.76	0.642	0.872
Probability violation email privacy	53.1	99.445	0.668	0.555	0.878
Probability website tracking	52.13	109.247	0.315	0.258	0.895

Probability getting a virus	53.33	96.693	0.598	0.513	0.882
Probability receiving spam	52.14	106.238	0.46	0.414	0.889
Experimental Group					
Probability auction fraud	51.66	111.872	0.68	0.53	0.888
Probability online stalking	51.97	104.992	0.761	0.672	0.883
Probability ID-theft	51.73	108.017	0.752	0.69	0.883
Probability personal information being sold	51.52	108.941	0.7	0.639	0.887
Probability unauthorized access to information	51.54	107.391	0.76	0.612	0.883
Probability being harrassed	51.23	110.756	0.647	0.542	0.89
Probability password theft	51.2	111.398	0.761	0.611	0.884
Probability violation email privacy	51.33	113.49	0.633	0.491	0.891
Probability website tracking	50.06	128.679	0.248	0.134	0.908
Probability getting a virus	51.13	118.75	0.578	0.429	0.894
Probability receiving spam	49.99	127.704	0.367	0.259	0.903

Table 32

Spearman Correlation Perceived Probability and Unrealistic Optimism for the control group (N = 137) and the Experimental Group (N = 142)

	1	2
Control group		
1. Perceived probability scale	1	
2. Unrealistic optimism scale	.029	1
Experimental group		
1. Perceived probability scale	1	
2. Unrealistic optimism scale	.181	1

Table 33

Scores on the Experience Scale (N=282)

Scale score	N	%	Cumulative %
0	8	2.8	2.8
1	13	4.6	7.4
2	22	7.8	15.2
3	58	20.6	35.8
4	52	18.4	54.3
5	40	14.2	68.4
6	30	10.6	79.1
7	26	9.2	88.3
8	16	5.7	94
9	13	4.6	98.6
10	3	1.1	99.6
11	1	0.4	100
Total	282	100	

Table 34

Spearman's Rho Correlation Unrealistic Optimism Scale and Experience Scale (N=280)

	1	2
1. Unrealistic optimism scale	1	
2. Experience scale	.156**	1

** $p < .01$

Table 35

Descriptive Experience with Negative Online Events Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	4.68	4.45
Median	4	4
Mode	3	4
Std. Deviation	2.405	2.109
Minimum	0	0
Maximum	11	10

Table 36

Spearman's Rho Correlation Experience and Unrealistic Optimism for the Control Group (N = 138) and the Experimental Group (N = 142)

	1	2
Control group		
1. Experience scale	1	
2. Unrealistic optimism scale	.195*	1
Experimental group		
1. Experience scale	1	
2. Unrealistic optimism scale	.111	1

* $p < .05$

Table 37

Hours Spend Online (N=280)

	N	%	Cumulative %
Low users	112	40	40
High users	168	60	100
Total	280	100	

Table 38

One Way ANOVA Low and High Users of the Internet (N = 278)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.463	1	12.463	.182	.670
Within Groups	18929.753	276	68.586		
Total	18942.216	277			

Note. df = Degrees of Freedom, F = F-ratio (statistical test used for ANOVA)

Table 39

Descriptive Frequency of Using the Internet for Control Group (N = 139) and Experimental Group (N = 143)

	Control group	Experimental group
Mean	5.64	5.54
Median	5	5
Mode	4	5
Std. Deviation	2.559	3.053
Minimum	1	1
Maximum	14	18

Table 40

One Way ANOVA Low and High Users of the Internet between Control Group (N = 136) and Experimental Group (N = 141)

	Sum of Squares	df	Mean Square	F	Sig.
Control group					
Between Groups	3.539	1	3.539	.051	.822
Within Groups	9341.278	134	69.711		
Total	9344.816	135			
Experimental group					
Between Groups	3.604	1	3.604	.049	.824
Within Groups	10127.601	139	72.86		
Total	10131.206	140			

Table 41

Spearman's Rho Correlation Perceived Severity Scale and Unrealistic Optimism Scale (N=279)

	1	2
1. Unrealistic Optimism Scale	1	
2. Perceived Severity Scale	-.150*	1

* $p < .05$

Table 42

Descriptives Perceived Severity Scale Control Group (N = 139) and Experimental group (N = 143)

	Control Group	Experimental group
Mean	771.439	769.818
Median	764	771
Mode	621	841
Std. Deviation	177.636	143.119
Minimum	138	425
Maximum	1100	1075

Table 43

Item-Total Statistics Severity scale

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Control group					
Severity auction fraud	704.99	24266.176	0.597	0.444	0.867
Severity online stalking	697.45	25002.853	0.508	0.572	0.873
Severity online ID theft	687.53	26540.707	0.456	0.455	0.876
Severity personal information being sold	695.66	24663.683	0.591	0.52	0.868
Severity someone has unauthorized access to personal information	695.6	24486.007	0.644	0.555	0.865
Severity online being harassed	700.14	24056.326	0.566	0.568	0.869
Severity password theft	696.65	24381.318	0.622	0.491	0.866
Severity violation email privacy	704.84	23003.724	0.776	0.678	0.855
Severity website tracking	730.18	22856.091	0.642	0.607	0.864
Severity getting a virus	706.02	24269.095	0.569	0.359	0.869
Severity getting spam	734.37	23144.015	0.554	0.567	0.873
Experimental group					
Severity auction fraud	699.75	17641.809	0.452	0.251	0.845
Severity online stalking	690.13	18309.815	0.409	0.387	0.847
Severity online ID theft	681.06	18680.067	0.404	0.314	0.848
Severity personal information being sold	690.69	17846.13	0.479	0.31	0.843

Severity someone has unauthorized access to personal information	691.01	17113.465	0.619	0.477	0.833
Severity online being harassed	697.74	17435.658	0.427	0.346	0.848
Severity password theft	689.48	17408.547	0.581	0.414	0.836
Severity violation email privacy	698.1	16222.503	0.693	0.566	0.825
Severity website tracking	726.88	15967.148	0.652	0.54	0.828
Severity getting a virus	699.21	16731.998	0.543	0.391	0.838
Severity getting spam	734.13	15624.731	0.652	0.549	0.829

Table 44

Spearman Correlation Severity and Unrealistic Optimism for the control group (N = 137) and the Experimental Group (N = 143)

	1	2
Control group		
1. Perceived severity scale	1	
2. Unrealistic optimism scale	-.249	1
Experimental group		
1. Perceived severity scale	1	
2. Unrealistic optimism scale	-.053	1

** $p < .01$

Table 45

Frequency Table of the Group with Self-protective Measures (N=262) and the Group without Self-protective Measures (N=20)

	N	%	Cumulative %	Median
No measures	20	7.1	7.1	-2.5
With measures	262	92.9	100	-6
Total	282	100		

Table 46

Difference in Intention between a Group with Self-Protective Measures (N = 262) and a Group without Self-Protective Measures (N = 20)

Mann-Whitney U test	
Mann-Whitney U	1778.5
Wilcoxon W	36231.5
Test Statistic	1778.5
Standard Error	351.224
Standardized Test Statistic	-2.396
Asymptotic Sig.(2-sided test)	.017*

*$p < .05$

Table 47

Unrealistic Optimism of Group with No Measures (N = 20) and Group with Many Measures (N = 262)

	Self-protective measures	
	Without measures	With measures
Mean	-2.2	-7.32
Median	-2.5	-6
Mode	0	0
Std. Deviation	8.069	8.540
Skewness	.107	-.450
Kurtosis	.665	.470
Minimum	-20	-33
Maximum	15	18

Table 48

Difference in Unrealistic Optimism between Group with Measures and Group without Measures when Looking at Control (N = 138) and Experimental Group (N = 142)

	N	Mean	Std. Deviation
Control Group			
No measures	12	-4.42	6.973
With measures	126	-6.5	8.423
Experimental group			
No measures	8	1.13	8.903
With measures	134	-7.7	8.108

Table 49

Difference in Unrealistic Optimism when Comparing Having No Measures with Having Measures when Looking at Control Group (N = 138) and Experimental group (N = 142)

	Control Group	Experimental Group
Mann-Whitney U	654	254*
Test Statistic	654	254
Standard Error	132.167	112.901
Standardized Test Statistic	-0.772	-2.498
Asymptotic Sig.(2-sided test)	.44	.012

*$p < .05$

Table 50

Descriptive Group with Few Measures (N = 75) and Group with Many Measures (N = 207)

	Self-protective measures	
	Few measures	Many measures
Mean	-4.33	-7.90
Median	-3	-7
Mode	-8	-6
Std. Deviation	7.495	8.785
Skewness	-.054	-.430
Kurtosis	.121	.437
Minimum	-21	-33
Maximum	15	18

Table 51

Results of Mann-Whitney U Test when comparing Group with Few Measures (N = 75) and Group with Many Measures (N = 207)

Mann-Whitney U Test	
Mann-Whitney U	5966**
Wilcoxon W	27494
Test Statistic	5966
Standard Error	604.553
Standardized Test Statistic	-2.972
Asymptotic Sig.(2-sided test)	.003

** $p < .01$

Table 52

Difference in Unrealistic Optimism between Control Group (N = 138) and Experimental Group (N = 142) when Looking at Having Few or Many Measures

	N	Mean	Std. Deviation
Control Group			
Few measures	40	-4.3	7.481
Many measures	98	-7.14	8.518
Experimental Group			
Few measures	35	-4.37	7.62
Many measures	107	-8.13	8.434

Table 53

Difference in Unrealistic Optimism when Looking at Having Few Measures or Many Measures when Looking at Control Group (N = 138) and Experimental Group (N = 142)

	Control Group	Experimental Group
Mann-Whitney U	1561	1427.5*
Test Statistic	1561	1427.5
Standard Error	212.81	211.022
Standardized Test Statistic	-1.875	-2.109
Asymptotic Sig.(2-sided test)	.061	.035

*$p < .05$

Table 54

Frequencies Group with Unrealistic Optimism and Group without Unrealistic Optimism (N=282)

	N	%	Cumulative %
Group with unrealistic optimism	219	77.7	77.7
Group without unrealistic optimism	63	22.3	100
Total	282	100	

Table 55

Descriptive Group with Unrealistic Optimism and Group Without Unrealistic Optimism[a]

	With Unrealistic Optimism	No Unrealistic Optimism
N	219(216)	63(62)
Mean	-9.9(-9.64)	3.48(3.24
Median	-8(-8)	2(2)
Mode	-8(-8)	0(0)
Std. Deviation	7.075(6.592)	4.055(3.634)
Skewness	-1.018(-.845)	1.529(1.280)
Kurtosis	.773(.216)	2.212(1.026)
Minimum	-33(-30)	0(0)
Maximum	-1(-1)	18(15)

[a]The values in parentheses are the values after excluding the outliers.

Table 56

Comparing the Mean Level of Intentions between the Group with Unrealistic Optimism (N=216) and the Group without Unrealistic Optimism (N=62)

Mann-Whitney U test	
Mann-Whitney U	8334.5**
Test Statistic	8334.5
Standard Error	557.74
Standardized Test Statistic	2.938
Asymptotic Sig.(2-sided test)	.003

** $p < .01$

Table 57

Descriptive of Intention to Use Public Wi-Fi Networks of Group with Unrealistic Optimism (N = 216) and without Unrealistic Optimism (N = 62)

	With Unrealistic Optimism	Without Unrealistic Optimism
Mean	38.02	49.19
Median	30.5	47
Mode	50	30
Std. Deviation	28.537	26.905
Skewness	.318	.114
Kurtosis	-1.209	-1.144
Minimum	0	1
Maximum	100	100

Table 58

Differences in Intention to Use Public Wi-Fi Networks between Low Intention Group (N=139) and High Intention Group (N=143)

	Low intention group	High intention group
Mean	15.24	64.74
Median	15	66
Mode	30	50
Std. Deviation	10.576	16.606
Skewness	.162	.084
Kurtosis	-1.332	-1.033
Minimum	0	35
Maximum	34	100

Table 59

Recoded Education Level (N=282)

	N	%	Cumulative %
Lower education	64	22.7	22.7
Bachelor	160	56.7	79.4
Master	58	20.6	100
Total	282	100	

Table 60

Goodness of Fit Test for Unrealistic Optimism and Intention to Use Public Wi-Fi Networks (N = 275)

	Chi-square	df	Sig.
Step	17.3	1	.000
Block	17.3	1	.000
Model	17.3	1	.000

Note. df = Degrees of Freedom

Table 61

Hosmer and Lemeshow Test

Chi-square	df	Sig.
3.412	8	.906

Note. df = Degrees of Freedom

Table 62

Variability Explained by the Model

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
363.753	.061	.081

Table 63

Correctly Classified Cases Model 1 with Unrealistic Optimism

	Predicted		
Observed	Low intention	High intention	% Correct
Low intention	71	63	53
High intention	46	95	67.4
Overall Percentage			60.4

Table 64

Results Logistic Regression with Unrealistic Optimism Scale (N = 275)

	B	S.E.	Wald	df	Sig.	Exp(B)
Unrealistic optimism	.064	.016	15.61	1	.000	1.067
Constant	.472	.163	8.352	1	.004	1.603

Table 65

Goodness of Fit for Model with All Predictors (N = 275)

	Chi-square	df	Sig.
Step	38.846	11	.000
Block	38.846	11	.000
Model	56.146	12	.000

Table 66

Hosmer and Lemeshow test

Chi-square	df	Sig.
9.258	8	.321

Table 67

Variability Explained by Model with All Predictors (N = 275)

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
324.906	.185	.246

Table 68

Correctly Classified Cases Model 2 with Unrealistic Optimism

	Predicted		
Observed	Low intention	High intention	% Correct
Low intention	84	50	62.7
High intention	44	97	68.8
Overall Percentage			65.8

Table 69

Results Logistic Regression with all Predictors (N = 275)

	B	S.E.	Wald	df	Sig.	Exp(B)
Unrealistic Optimism Scale	0.071	0.021	12.057	1	.001	1.074
Gender (1 = male)	-0.075	0.294	0.065	1	.799	0.928
Age	-0.022	0.012	3.285	1	.07	0.978
Education (master)			7.696	2	.021	
Education (1 = lower education)	1.217	0.44	7.656	1	.006	3.375

Education (2 = bachelor)	0.722	0.369	3.829	1	.05	2.059
Probability Scale	-0.043	0.013	10.635	1	.001	0.958
Controllability Scale	0	0.001	0.137	1	.712	1
Severity Scale	0.003	0.001	9.232	1	.002	1.003
Self-Protective Measures (1 = no measures)	1.004	0.681	2.178	1	.14	2.73
Frequency Internet Use	-0.008	0.053	0.025	1	.876	0.992
Group (1 = control group)	-0.037	0.271	0.018	1	.893	0.964
Experience (1 = no experience)	1.109	0.89	1.552	1	.213	3.031
Constant	0.455	1.039	0.192	1	.661	1.576

Note. S.E. = Standard Error, df = Degrees of Freedom, Exp (B) = Expected Beta, CI = Confidence interval

Appendix 3

Figures

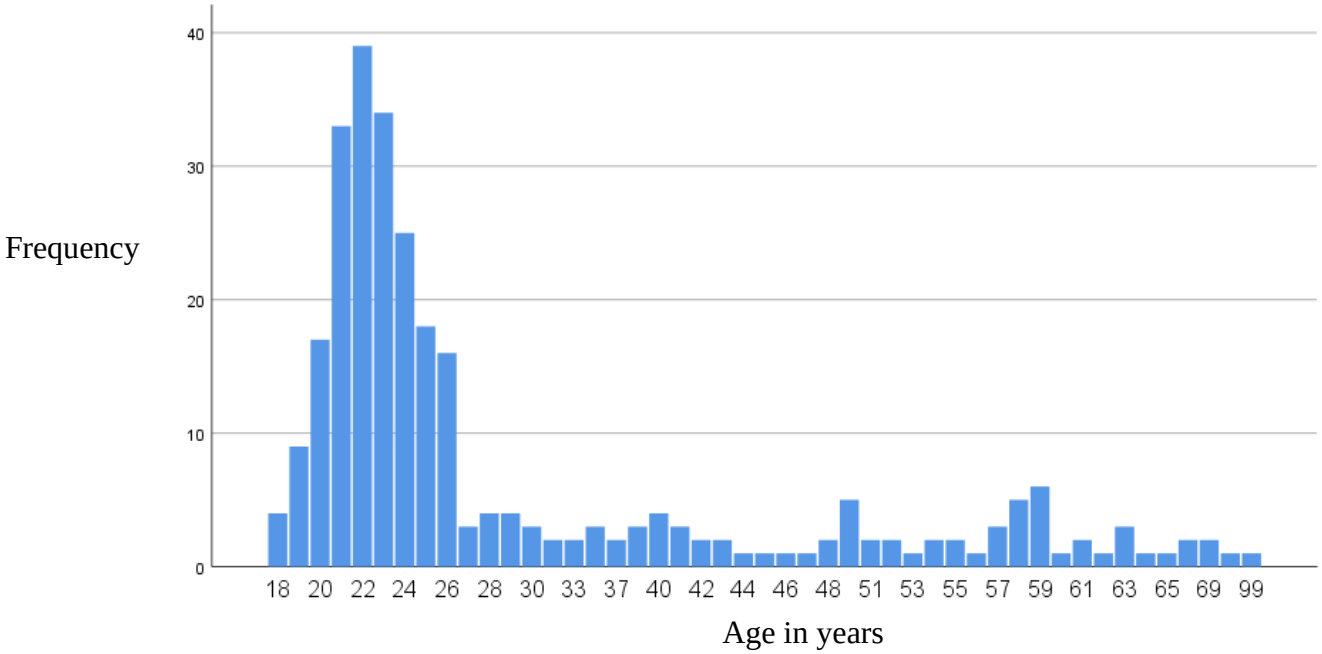


Figure 1. Age of Respondents (N=282)

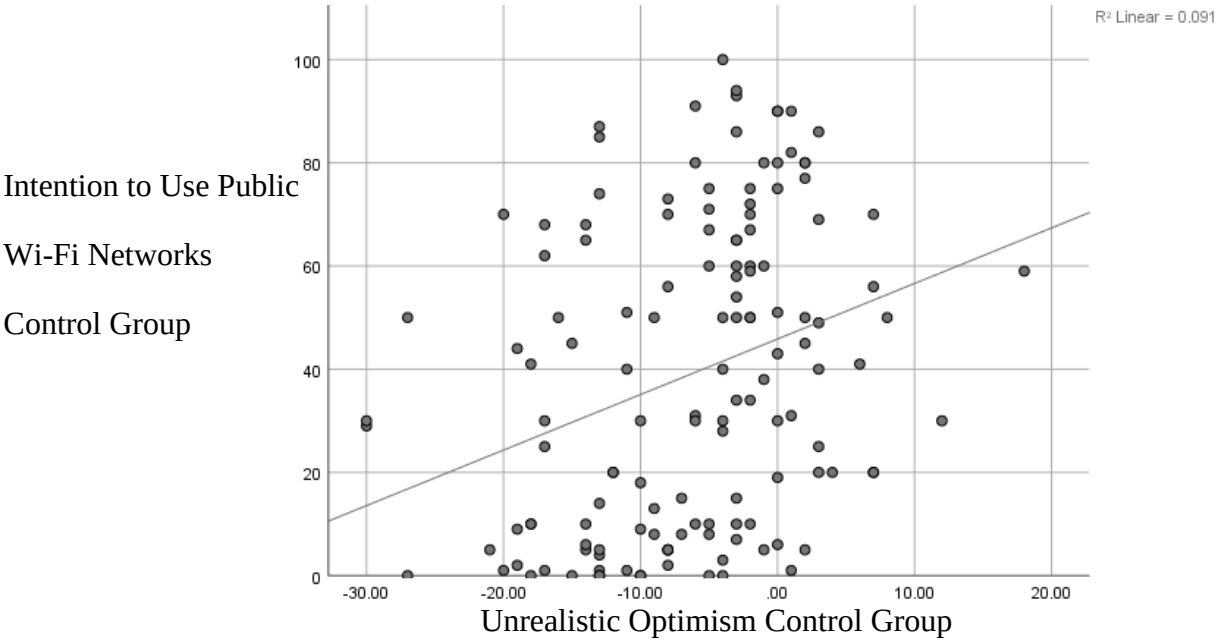


Figure 2. Scatterplot Unrealistic Optimism of the Control Group and Intention to Use Public Wi-Fi Networks (N = 138)

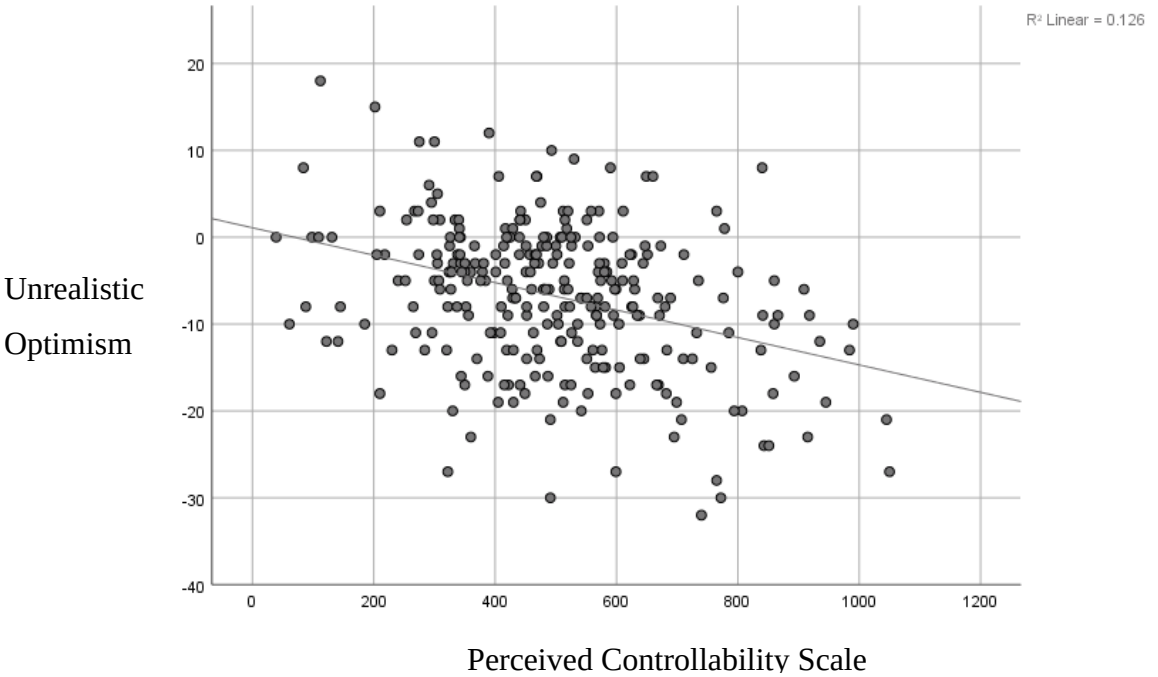


Figure 3. Scatterplot Unrealistic Optimism Scale and Perceived controllability (N = 280)

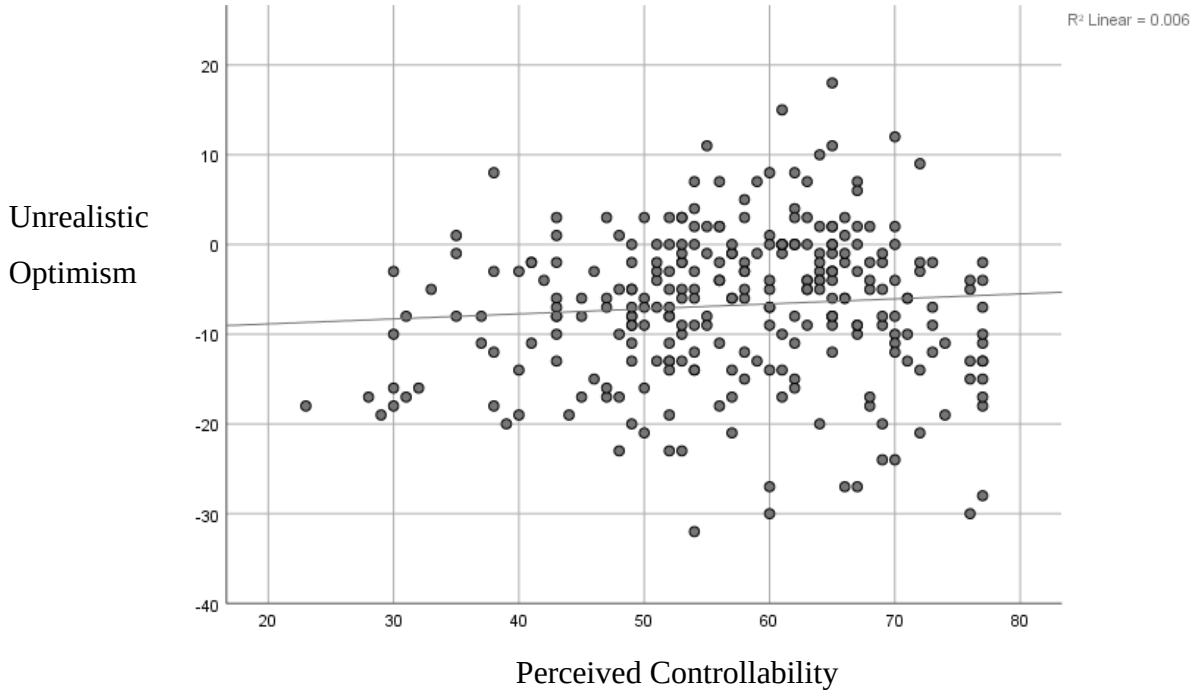


Figure 4. Scatterplot Perceived Probability Scale and Unrealistic Optimism Scale (N=280)

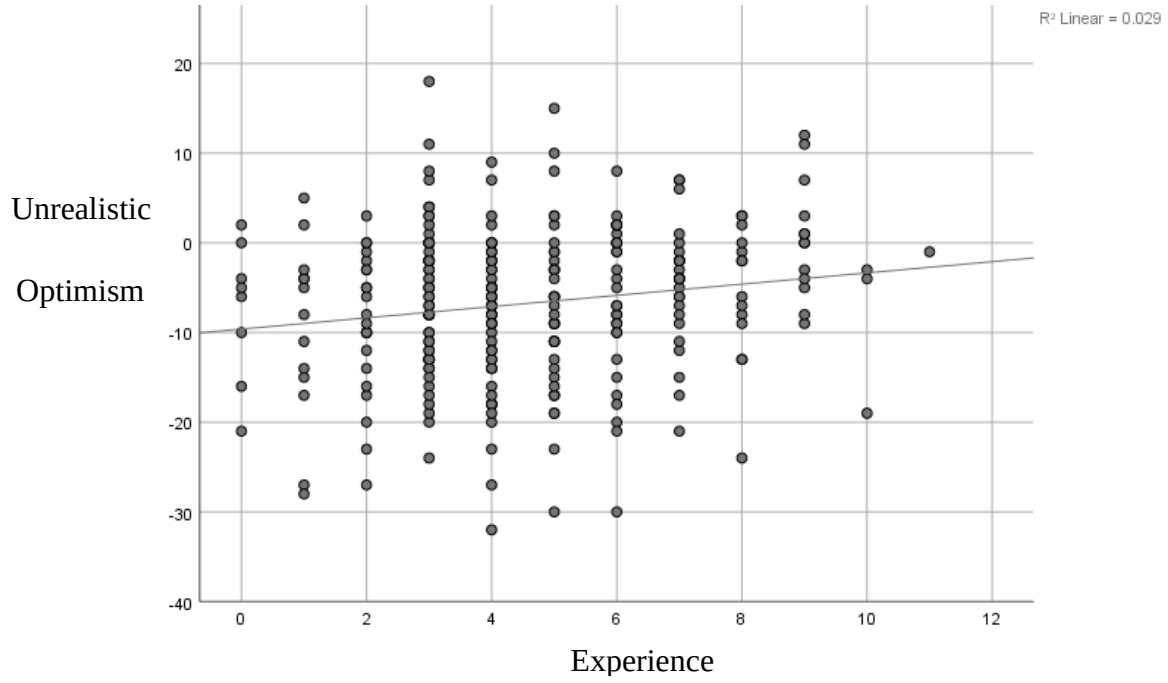


Figure 5. Scatterplot between Experience Scale and Unrealistic Optimism Scale (N = 280)

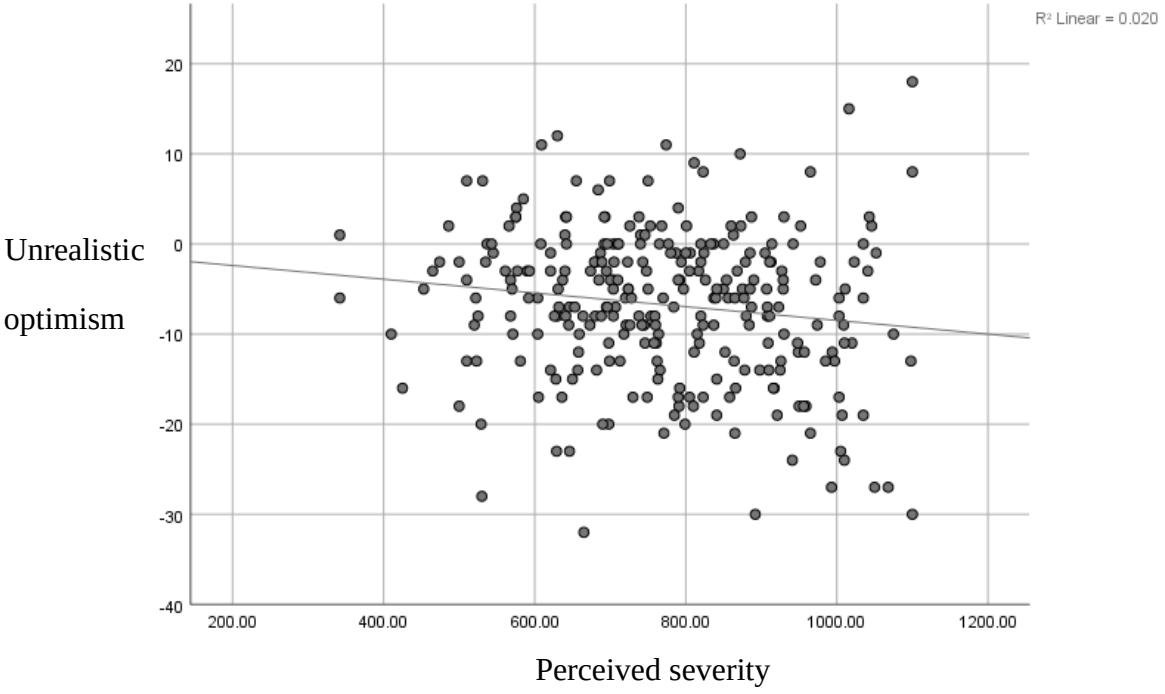


Figure 6. Scatterplot Unrealistic Optimism Scale and Perceived Severity Scale (N=279)

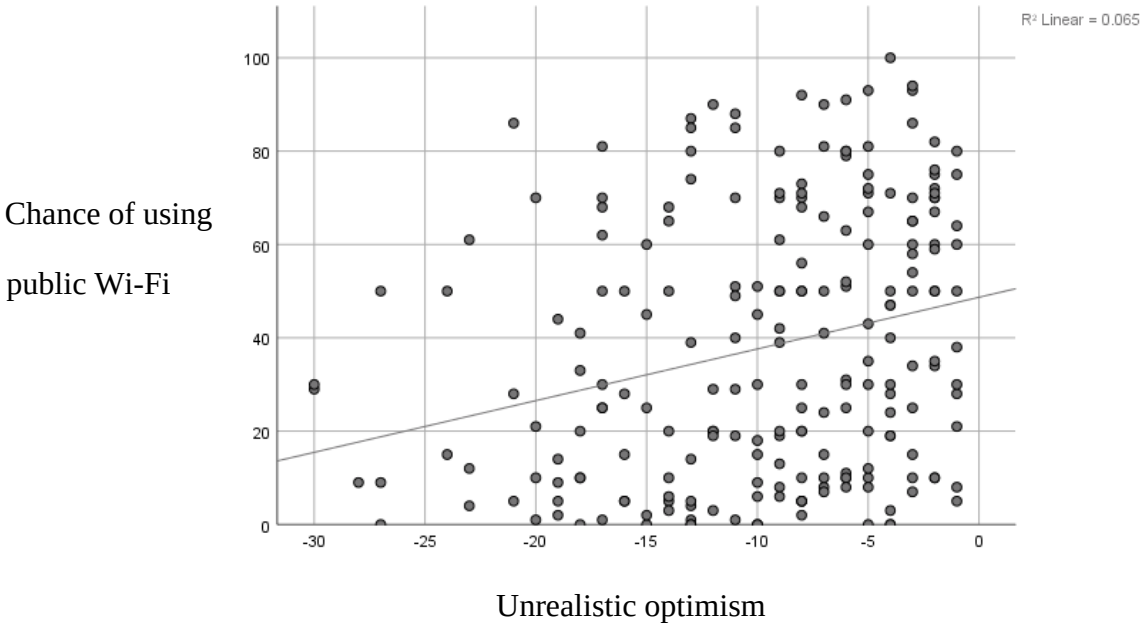


Figure 7. Scatterplot Unrealistic Optimism and Chance of Using Wi-Fi in a Public Space (N = 219)

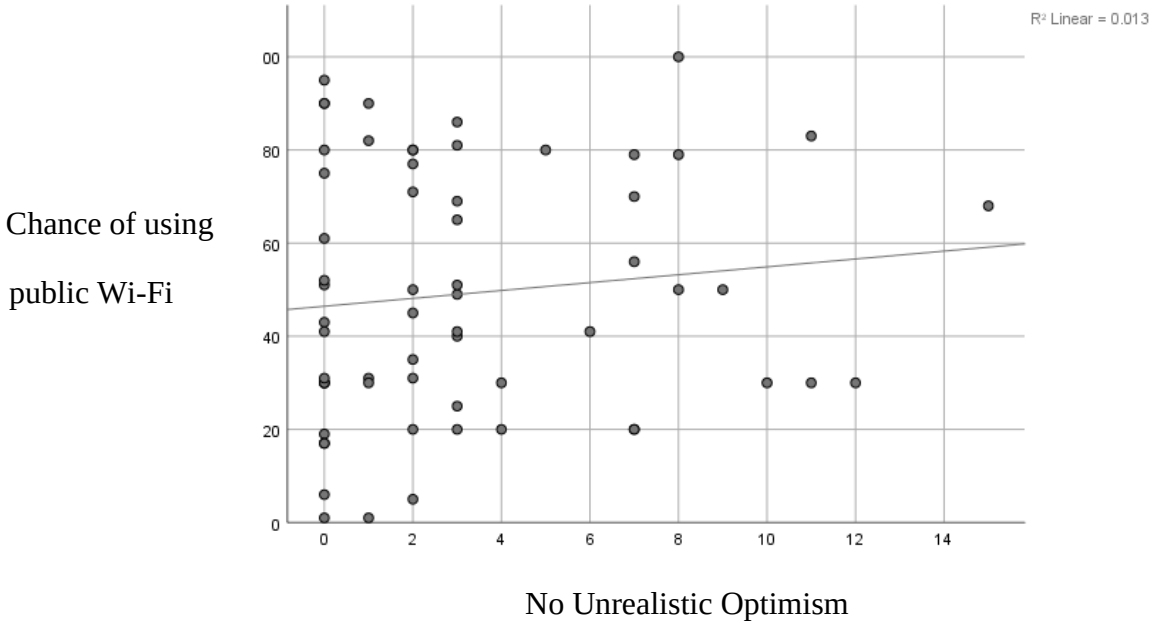


Figure 8. Scatterplot No Unrealistic Optimism and Chance of Using Wi-Fi in Public Space (N = 63)