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### **AN EVOLUTIONARY PERSPECTIVE: FROM COMPUTERS TO ANXIETY OF COMPUTER USERS**

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#### ***Abstract***

In today's technology oriented world, it is almost impossible to be isolated from the use of technology in daily life. Although these great developments in computer-based technologies make our lives easier, these rapid changes are also inevitable to intimidate some of the users. From the moment computer entered our lives, computer-based technologies have attracted many researchers from a variety of disciplines. However, the term computer anxiety, which is defined as a feeling of fear and apprehension that emerges when an individual is using a computer or thinking about the possibility of using a computer, has rarely been addressed in the literature. Therefore, we know little about how computer anxiety is defined and relates to other concepts. Accordingly, in this study, we will argue i) how the computer anxiety concept can be defined and conceptualized for future empirical investigations; ii) how computer anxiety can be developed, and iii) what can be the possible consequences of computer anxiety.

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**Keywords:** Anxiety, computer anxiety, computer users, antecedents and consequences of computer anxiety.



## 1. Introduction

The concept of anxiety refers to a mood state in which an individual experiences horror, uneasiness, nervousness, sadness, stress (Akiskal, 1985), and it is considered as an umbrella term that includes different conditions such as fear of speaking in groups, claustrophobia, or constant fear of close others being hurt. In daily life, anxiety acts as a red flag for often the forthcoming danger and serves as a prime for developing an appropriate dealing response (Beckers, Wicherts, & Schmidt, 2007). However, if anxiety becomes anomalously deep and/or prolix, it may accept as a pathological state of mind, culminating in depressed feelings and/or thoughts, unfavourable conditioned emotional and cognitive responses, blurry mindscapes, unsuccessful coping strategies, and some autonomic nervous system disorders (Craig, Brown, & Baum, 2000).

Recently, computer anxiety can be added to a list of common anxiety disorders. It can be briefly defined as a feeling of fear and apprehension that emerges when an individual is using a computer or thinking about the possibility of using a computer (Chua, Chen, & Wong, 1999). Specifically, as the advent of computers is an important factor that caused a radical and incremental change in education and business life, the rapid development of computer technology in these fields can have serious consequences for people with computer anxiety (McIlroy, Bunting, Tierney, & Gordon, 2001). Indeed, extensive study of computer anxiety over the past three decades has demonstrated that it is a not a simple unidimensional construct. For instance, behavioural indications used to measure computer anxiety are: avoiding computers and areas where computers are located (Loyd & Gressard, 1984), negative comments and expressions about computers (Marcoulides & Wang, 1990), trying to be extremely careful during computer use and attempting to shorten the required use of computers (Bozionelos, 2001). Nevertheless, several studies have stated that despite it is a robust phenomenon, computer anxiety is not clearly defined (Beckers, Wicherts, & Schmidt, 2007). Therefore, we know little about how computer anxiety is defined and relates to other concepts.

Accordingly, in this study, we will argue:

- how the computer anxiety concept can be defined and conceptualized for future empirical investigations;
- how computer anxiety can be developed;
- what can be the possible consequences of computer anxiety.

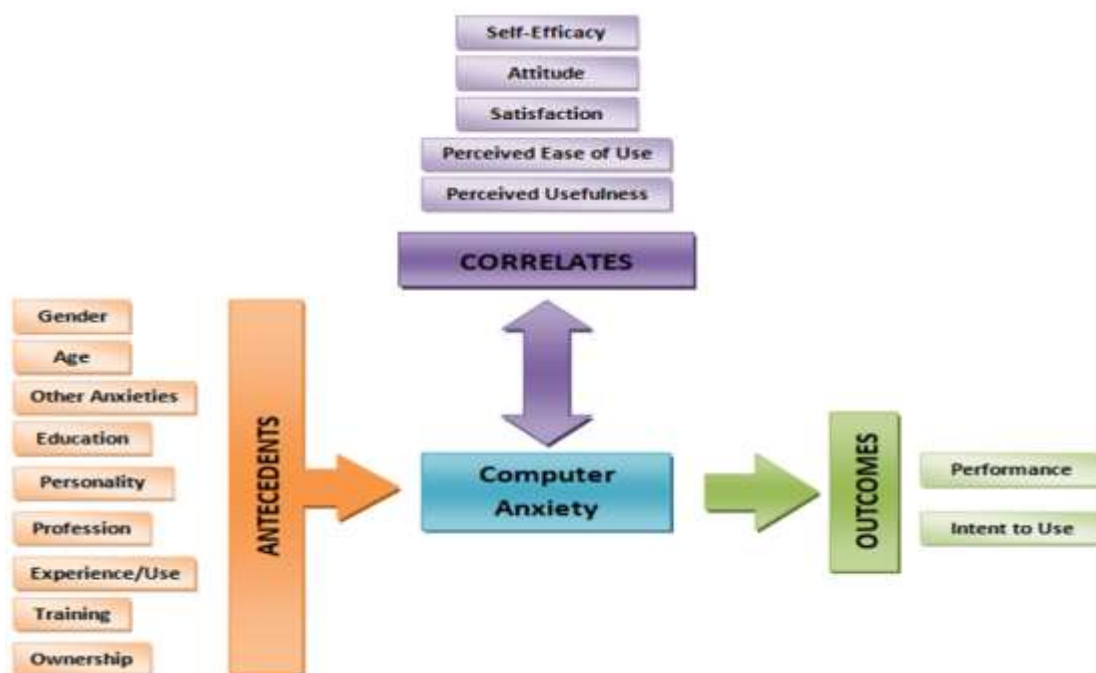
## 2. Background and Relevant Literature

### 2.1. Definition and Conceptualization of Computer Anxiety

As a result of today's infiltration of computers into many areas of our lives, many people have direct or indirect computer literacy experience. Although using computers makes life a great deal easier, it is not always a satisfying or fun event. What's more, some people have a strong aversion to working with computers, even fear them. These people experience different grades of a situation called "computer anxiety." (Beckers & Schmidt, 2003). Despite the fact that there is no agreement in the literature on the definition of computer anxiety (Ceyhan, 2006), it can be expressed as a term that is used to express negative emotions and cognitions awakened by an actual or imaginary interaction with computer-based technologies. In cases involving encounters with computers, it has a characteristic of being prone to the state of psychological distress (Bozionelos, 2001).

Furthermore, studies suggest that computer anxiety may be a multi-dimensional construct and mainly consist of four elements: (1) low self-esteem about computer skills, (2) negative emotional responses to computers, (3) feeling uncomfortable and agitated while using a computer or thinking about it, and (4) negative beliefs about computer's role in everyday life and business life (Beckers & Schmidt, 2001). More specifically, when something new has to be learned, anxiety arises in the individual (Hakkinen, 1994). This can adversely affect cognitive performance by creating resistance to change. As adults learn to use a computer, they often have feelings of fear, danger of failure and ignorance. These fears reveal negative learning attitudes and harm learning (Wlodkowski, 1993). The interaction between the computer and people is quite complicated. Hakkinen (1994) argues that this interaction affects various emotional reactions involving anxiety in the individual (Çevik, 2006).

Computer anxiety affects performance in tasks involving the use of computer-based technologies, and therefore causes significant economic costs (Bozionelos, 2001). Thus it is important to name the antecedents and correlates of computer anxiety, and to clarify the nature of the relationships. After reviewing 276 articles on computer anxiety Powell (2013) presented a comparison of research from 1990s and 2000s, which revealed nine antecedents, five correlates and two outcomes of computer anxiety (Figure 1). Antecedents of computer anxiety consists of two broad categories: (1) personal characteristics and (2) interactions between the person and computer. Personal characteristics include personality, gender, age, profession, education and other anxieties such as math anxiety or e-mail anxiety. Interactions between the person and the computer include ownership, training and use/experience. Affective responses to the computer or feelings toward computers are correlates to computer anxiety. Correlates include attitude, self-efficacy, satisfaction, perceived ease of use and perceived usefulness of the computer. Finally, intent to use and performance are the outcomes of computer anxiety (Powell, 2013).



**Figure 01.** Known antecedents, correlates and outcomes of computer anxiety

## 2.2. Antecedents of Computer Anxiety

Research on gender and computer use has produced results that often indicate that men have more computer experience and use than women. For this reason, women tend to show more computer anxiety than men (Durndell & Haag, 2002). But Powell (2013) showed that research on 1990s and 2000s split in half; one set finding gender isn't significantly related to computer anxiety and the other set indicating that females exhibit more computer anxiety than males. However, it should be taken into consideration that gender relationship is more clear with the studies using children as subjects, while collage students show no difference in computer anxiety in terms of gender and adult studies were more evenly split yet the majority still showing that females exhibit more computer anxiety than men (Powell, 2013). There is a belief in society that men are more likely to be more technical than women. This may be the source of gender-related differences, and the distribution of roles in traditional societies may also reveal this distinction. In patriarchal societies, as in almost every case, the opinion of "the computer must be learned first by the man" may cause the levels of anxiety to differ on this level (Çevik, 2006).

Although a large proportion of studies conducted in the 1990s did not find any relationship between computer anxiety and age, studies that examined a wider age range reported that there was a significant relationship (Chua, Chen, & Wong, 1999). Parasuraman & Igarria (1990) examined gender differences in the relation between computer anxiety and age, finding that age was positively related to computer anxiety for women, while the relationship wasn't significant for men. Powell (2013) indicates that research in the 1990s show no significant relationship between age and computer anxiety in adult samples, while in 2000s age was found to be positively related to computer anxiety. This may be due to the difference in the amount of exposure to computers during school and at work, because computers became more pervasive in these areas after the year 2000. Therefore, older adults who doesn't have the same level of experience and education on computers tend to show a higher degree of computer anxiety than younger adults who are more likely to be exposed to computers through school (Powell, 2013).

Computer experience is shown to be the most consistent correlate of computer anxiety, but the nature of the relationship -whether it is linear or non-linear- is yet to be explained (Bozionelos, 2001). Computer experience is the level to which an individual understands computer use and it consists of three components: (1) the amount of time spent using computers at home, at work and in school, (2) the software and hardware used, (3) the frequency of computer use. Also, another part of the computer experience is how an individual feels about these components (Potosky & Bobko, 1998; Smith, Caputi, Crittenden, Jayasuria, & Rawstorne, 1999).

The results of a series of studies have found a negative relationship between an individual's total experience of computer use and computer anxiety (Heinssen, Glass, & Knight, 1987). But this relationship isn't that clear. An individual's feelings about his/her first experience with a computer and about events significantly impact on his/her present feeling about technology matters explaining the relationship between computer experience and computer anxiety. Many individuals who had a negative first experience and lived negative significant events preserved computer anxiety and in some cases, while gaining more experience they become even more anxious (Rosen, Sears, & Weil, 1987). In conclusion, literature on computer anxiety suggests that a negative first experience with a computer and not receiving support during this negative experience may adversely influence the amount of experience gained in the later years, which may cause the development of computer anxiety (Beckers & Schmidt, 2003).

Researches about computer ownership and computer anxiety in the literature show that the computer attitudes of individuals who have computers in the place where they stay, are more positive and the level of their computer anxiety is lower (Levin & Gordon, 1989). Individuals who own a computer in their place, are increasingly interested in the computer and the level of anxiety decreases because i) they are more likely to spend time with the computer, ii) they are more likely to research topics, and iii) they are interested in their own computers and Internet (Çevik, 2006).

State, trait, e-mail, Internet, math and computer-mediated communication anxieties, and general distress and depression were some of the other anxieties that were shown to be positively related to computer anxiety. On the other hand, computer anxiety and education level was shown to be negatively related in the majority of the studies, and also, some collage majors related to science and technology were found to have lower computer anxiety than others (Powell, 2013).

### **2.3. Correlates and Consequences of Computer Anxiety**

People who have elevated levels of confidence in their abilities tend to show lower levels of computer anxiety (Kinzie, Delcourt, & Powers, 1994). Self-efficacy theory of Bandura (1977) suggests that an individual's behavior is estimated by their beliefs about their capabilities, rather than their true capabilities. Thatcher & Perrew (2002) suggest a negative relationship between computer self-efficacy and computer anxiety, which is consistent with the theory explained above. However, a considerable amount of studies on computer anxiety found a negative relation with attitude towards computers (Powell, 2013). As the computer anxiety of an individual increases, his/her attitude towards computers becomes more negative and vice versa (Rosen, Sears & Weil, 1993).

Studies on the effect of computer anxiety on satisfaction is sparse. Although computer anxiety considered to be negatively related to satisfaction in the beginning, Parayitam, Desai, Desai & Eason, (2010) suggests that as an individual gets used to computers, his/her anxiety becomes a positive force and eventually cause an increase in the job satisfaction.

Perceived ease of use can be defined as the extent to which a person thinks that using a computer-based technology won't require effort (Venkatesh, 2000). Powell (2013) draws attention to the consistent results of the articles studied the relation between perceived ease of use and computer anxiety which indicate a negative relationship between the two. Whereas, studies on perceived usefulness resulted inconsistently, most of the research pointing at a negative relation, but the rest indicating no relationship at all (Powell, 2013).

Available research on computer anxiety and performance indicates mixed results. Although some of the research in literature suggest a negative relationship between computer anxiety and performance, some studies found no relationship between the two (Parayitam, Desai, Desai, & Eason, 2010). Parayitam et al. (2010) suggest that individuals with increased levels of computer anxiety attempt to avoid computer usage and spent less time on tasks including computers. Therefore their performance suffers, which in turn leads to low career satisfaction as most of the careers involve the use of computers and information technologies (Chou, 2001). But Parayitam, Desai, Desai, & Eason, (2010) also suggest that attitude towards computer helps to lower the strength of the negative relationship between computer anxiety and career satisfaction.

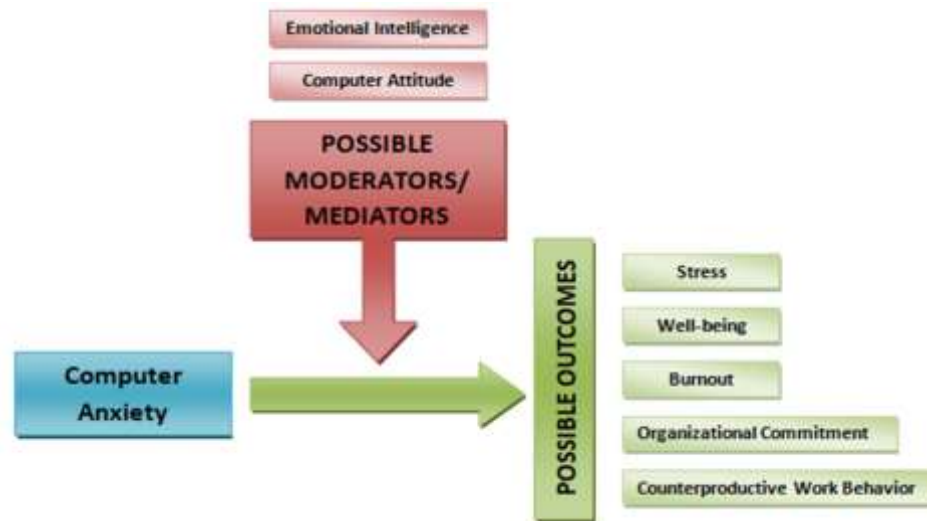
Research involving intent to use and computer anxiety represents a relatively blurred picture as well. The majority of the studies supporting a negative relationship between the two, but others indicate no relation at all (Powell, 2013).

### **3. Discussion and Implications**

As Gackenbach (1998) predicted two decades ago, as a result of the i) widespread use of the Internet, ii) change and advance in computer-based technologies, and iii) the fact that our daily lives and business life have been completely infiltrated by these technologies, this phenomenon deserves special attention as a matter to be investigated even today. The rapid development of mobile technology makes things even more complicated because individual's can access the Internet from their mobile phones and use them as minicomputers for many purposes.

The incredible advancement that is increasingly taking place in computer-based technologies, mobile technologies and information and communication technologies also necessitate the re-evaluation and updating of the concept of computer anxiety. The scales used to measure this concept should also be able to keep pace with this rapid change. One of the most favoured scales is Heinssen's "Computer Anxiety Rating Scale (CARS)". This scale, originally developed in 1987, is still one of the most preferred scales, even in 2000's articles. But some of its items are out of date, and needs renewal. For example, the first item of the scale is "I feel insecure about my ability to interpret a computer printout.". Computer printouts in 1980s were quite complicated than today's, whereas the computers were quite simple in terms of functionality. But today's computers are rather smarter than their ancestors, and with the development of software for many different areas, it is much easier to understand the printouts. Therefore this item could be adapted to today's conditions or even excluded. The rest of the items still adheres to the concept, but after the 2000s computer itself changed remarkably. Today, even our phones can be used like computers. Technology is rapidly shifting towards smaller and mobile devices. With the adoption of these new technologies in daily life and business life, the fear of computers is also shifting towards something else, a more inclusive term "technophobia". Scales should be reconsidered with this new term in mind. Also, the threat perceived by an individual with high levels of computer anxiety, is now not only internal but also external. As the mobile technology and Internet becomes widely used, the danger of encountering cyber attacks is also increasing. This introduces another dimension to computer anxiety, which could be defined as the fear of cyber attack. Therefore, computer anxiety scales should include items in this context too.

The majority of the research in literature examines the relationship with computer anxiety and its antecedents, mainly gender and age (Durndell & Haag, 2002; Powell, 2013). There is also a certain amount of studies trying to explain the relation with personality, profession, education, ownership, training, use/experience and other anxieties. Self-efficacy, satisfaction, perceived ease of use and perceived usefulness of the computer are the main variables in the focus of studies searching for correlates. But studies on outcomes of computer anxiety is sparse. Intent to use and performance are the two outcomes of computer anxiety standing out in literature. Future research could focus on the relation with different variables such as stress, well-being, burnout, organizational commitment and counterproductive work behaviour. Also mediators and moderators can be involved in the research models. Emotional intelligence and computer attitude, for example, could be good candidates (Figure 2).



**Figure 02.** Proposed model for future studies

#### 4. Conclusion

Nowadays, technology is a requisite part of our life. As technology infiltrate through the walls of our comfort zone, computer anxiety will continue its existence by taking a new form. Therefore, our understanding and measuring equipment should evolve with it to keep up. Computer anxiety is still a hot topic for management and working psychology studies, as almost every employee use some kind of computer-based technology to do his/her job. Future research on computer anxiety and its antecedents, correlates and outcomes will provide a better understanding of the problem and illuminate our path to the solution.

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