Computer anxiety and its correlates: a meta-analysis

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Abstract

In this study we report results from a meta-analysis of relationships between computer anxiety and its three correlates—age, gender, and computer experience. Only studies published between 1990 and 1996 were included in the analysis. Findings of this meta-analysis are: (1) female university undergraduates are generally more anxious than male undergraduates, but the strength of this relationship is not conclusive; (2) instruments measuring computer anxiety are generally reliable, but not compatible with one another; and (3) computer anxiety is inversely related to computer experience, but the strength of this relationship remains inconclusive. Limitations of the methodology and implications of the findings are discussed. Directions for future studies are suggested. © 1999 Elsevier Science Ltd. All rights reserved.

Keywords: Computer anxiety; Meta-analysis

1. Introduction

The main objective of this study is to summarise research findings related to computer anxiety. We are particularly interested in the relationships between computer anxiety and its three most commonly researched correlates, namely gender, age, and computer experience. The reason we chose to conduct a meta-analysis is threefold. First, findings of the relationships between computer anxiety and these...
three correlates are divergent. It is almost impossible to draw an overall conclusion using traditional review methods. Second, most of the previous reviews are mainly descriptive. They do not cite empirical results to support their review conclusions (e.g. Cambre & Cook, 1985; Maurer, 1994; Torkzadeh & Angulo, 1992), and the studies reviewed are mainly the ones published in the 1980s. Therefore, conclusions of these reviews may vary from those based on findings from more recent studies. Third, most recently conducted studies report results of inferential test statistics such as \( r \) or \( t \), which are necessary for meta-analysis. In this aspect, meta-analysis seems to be a good and practical choice to summarise and moderate results of these studies, because it “emphasises explicit decision rules, systematic retrieval of information and quantitative procedures for integrating results of previous studies” (Cooper & Hedges, 1994). In this paper, we first describe what computer anxiety is, the relationships among the three correlates and computer anxiety drawn from previous studies and meta-analysis method and results. Finally, we discuss implications, limitations and suggestions for future studies.

2. Computer anxiety

The existence of computer anxiety is commonly recognised by researchers (Cambre & Cook, 1985; Torkzadeh & Angulo, 1992). Its existence has also drawn attention of educational researchers as the use of computers in the classroom has grown. It is our conviction that understanding the nature of computer anxiety may help educators in minimising the degree of its negative impact or in the selection of better remedial or even preventive treatments. The following four statements, derived from previous studies, summarise and characterise the nature of computer anxiety.

2.1. Computer anxiety is a fear for computers when using the computer, or when considering the possibility of computer use

Computer anxiety is commonly defined as emotional fear, apprehension and phobia felt by individuals towards interactions with computers or when they think about using computers (Herdman, 1983; Howard, 1986). In this meta-analysis, terms such as fear, apprehension, discomfort, computer-phobia and anxious responses are used interchangeably to describe computer anxiety.

2.2. Computer anxiety is a kind of ‘state anxiety’ which can be changed

A number of researchers (Cambre & Cook, 1985; Heinssen, Glass & Knight, 1987; Oetting, 1983; Raub, 1981; Toris, 1984) proposed that computer anxiety is a kind of “state anxiety”, as opposed to trait anxiety, which is susceptible to changes. Many empirical studies support this proposition. For example, Rosen, Scars and Weil (1993) reported that the self-rating computer anxiety score of 204 secondary school students was significantly reduced from pre-test to post-test after attending a
Computer-Phobia Reduction Programme. Torkzadeh and Angulo (1992) also found that computer anxiety was reduced by computer training.

2.3. *Computer anxiety is measurable in multiple dimensions*

Computer anxiety is a complex psychological construct. It cannot be fully described from a single perspective. For example, Howard (1986) suggested two dimensions: duration of computer anxiety (temporary vs permanent) and intensity of computer anxiety (normal vs neurotic) to measure computer anxiety. Other examples include: general computer anxiety and equipment anxiety (Marcoulides & Wang, 1990); learning anxiety, computer equipment anxiety, computer message anxiety, and computer observing anxiety (McInerney, McInerney & Sinclair, 1994); interactive computer learning anxiety, consumer technology anxiety and observational computer learning anxiety (Rosen & Weil, 1995).

2.4. *Computer anxiety causes computer use avoidance*

Researchers found that computer anxiety usually causes computer use avoidance. For example, Weil and Rosen (1995) indicated that the avoidance of computer use for teachers is caused by computer anxiety. Harrington, McElroy and Morrow (1990) also found that one of the causes of computer use avoidance amongst undergraduate students is the fear of using computers. Furthermore, Torkzadeh and Angulo (1992) suggested that computer use avoidance could be viewed from three perspectives of computer anxiety: psychological, sociological, and operational. The psychological perspective focuses on fear of damaging the computer system and computer files. The sociological perspective focuses on fear related to changes of social pattern, job demands and the insecure job status due to computerisation. The operational perspective is caused by operational problems when performing computer-related tasks. All three cause computer use avoidance.

Computer anxiety is, therefore, a kind of state anxiety, which can be changed and measured along multiple dimensions.

3. Correlates of computer anxiety

Correlates of computer anxiety include: gender, age, computer experience, locus of control, cognitive appraisal, math anxiety, communication apprehension, computer course structure, and learning styles (Ayersman & Reed, 1996; Bohlin, 1992; Bohlin & Hunt, 1995; Carlson & Wright, 1993; Chu & Spires, 1991; Colley, Gale & Harris, 1994; Farina, Arce, Sobral & Carames, 1991; Igbaria & Parasuraman, 1989; Jones & Wall, 1990; Kernan & Howard, 1990; Massoud, 1991; McInerney et al., 1990; Nelson & Kletke, 1990; Todman & Monaghan, 1994; Weil & Rosen, 1995). This meta-analysis only focuses on the three most commonly examined correlates: gender, age, and computer experience.
3.1. Gender

Studies on the relationships between computer anxiety and gender report inconclusive results. Some studies indicate that gender is correlated to computer anxiety (Bozionelos, 1996; Busch, 1995; Chu & Spires, 1991; Farina, 1991; Igbaria & Chakrabarti, 1990; Liu, Reed & Phillips, 1992; Massoud, 1991; Nelson, Wiese & Cooper, 1991; Okebukola, 1993; Rosen & Weil, 1995; Siann, Macleod, Glissov & Durndell, 1990; Sigurdsson, 1991). They suggested that females exhibit a higher degree of computer anxiety than males. However, in contrast, some studies find this relationship non-significant (Carlson & Wright, 1993; Charness, Schumann & Boritz, 1992; Dyck & Smither, 1994; Parasuraman & Igbaria, 1990; Todman & Monaghan, 1994; Woodrow, 1991). Rosen and Maguire (1990) did a meta-analysis of studies on computer anxiety and found that women exhibited slightly more, but not significantly more, computer anxiety than men (Rosen & Maguire, 1990, p. 180). Therefore, the gender factor on computer anxiety is still inconclusive.

3.2. Age

Findings relating computer anxiety and age are surprising. Contrary to a common over-generalised impression that older people are more anxious toward the use of computers than younger people, many studies find no relationships between computer anxiety and age (e.g. Henderson et al., 1995). Only studies with a wide age range report significant relationships. For example, Dyck and Smither (1994) investigated computer anxiety of 203 senior citizens and 219 undergraduates, a wide age range target population, and the result showed a significant relationship. In other words, when the age range is narrow, the relationship is not easily observed. However, as the age range becomes wider, the relationship becomes more vivid and observable.

3.3. Computer experience

The correlation between computer anxiety and prior computer experience is the most consistent finding. Examples of computer experience include computer courses, computer training, ownership of computer at work or at home, computer games experience, and hands-on computer experience (e.g. Bohlin & Hunt, 1995; Carlson & Wright, 1993; Mawhinney & Sarawat, 1991; Okebukola, Sumampouw & Jegede, 1992). Results show that computer anxiety can be reduced by exposing people to computers, but that depends on the type of exposure. Exposure to a programming course, for example, did not reduce computer anxiety (Leso & Peck, 1992; Woodrow, 1991). Some studies focus not only on the exposure to computers, but also on the amount of it. Self-reported computer experience questionnaires are usually used to quantify computer experience. Measures of the amount of computer experience include: number of computer courses previously attended, number of years using computers, number of computer course hours, and frequency of use of computers at work or at home (Bohlin & Hunt, 1995; Colley et al., 1994;

4. Materials and methods

Cooper’s (1989) five-stage model of the integrative review as a research process was used to conduct this meta-analysis. The five stages are: (1) problem formulation; (2) data collection; (3) data evaluation; (4) analysis and interpretation; and (5) public presentation.

4.1. Problem formulation

Three meta-analytic questions of this study are:

1. What is the overall relationship between gender and computer anxiety?
2. What is the overall relationship between age and computer anxiety?
3. What is the overall relationship between computer experience and computer anxiety?

4.2. Data collection

Multiple sources of information, such as the ERIC (Educational Resources Information Center) database and Internet Educational Resources were searched to secure relevant research studies to our best effort. Descriptors such as computer, anxiety, phobia, attitude, correlate, and factor were used. In addition, on-line databases were searched via the Internet. Both published and unpublished empirical research studies that met the following two criteria were included in the meta-analysis. The criteria were:

1. studies which anchored computer anxiety as the dependent variable and investigated the relationships between computer anxiety and at least one of the three correlates (i.e. gender, age, and computer experience); and
2. studies which provided quantitative statistical results of the above relationships.

4.3. Data evaluation

To facilitate the evaluation of data (i.e. the collected research studies), coding sheets were developed to document relevant information. One main purpose of coding the information was to identify moderator variables, which can be used as criteria for grouping studies (Glass, Mcgaw & Smith, 1981). In order to ensure the reliability of the coding results, 10 studies were randomly selected and were coded independently by one of the researchers and a PhD student. The result of inter-coder agreement for
these 10 studies was 0.95. Through the analysis of the coded data, two moderator variables (target population and a measuring instrument) were identified. Results of the grouping using the two moderator variables are summarised in Tables 1 and 2.

4.4. Analysis of data

Data analysis stage consisted of four main steps: (1) grouping of studies; (2) transforming effect size (ES) indicators; e.g. $r$, $t$, $F$ ($F$-value) or $\chi^2$ (Chi-square) to $Z_s$ (Fisher $Z$); (3) test of homogeneity of $Z_s$s; and (4) combining and comparing Fisher $Z_s$s. These steps were based on meta-analytical procedures suggested by Rosenthal (1991) and Hedges and Olkin (1985). The groups of studies were further

Table 1
Grouping according to target population

<table>
<thead>
<tr>
<th>Target population</th>
<th>No. of studies</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>University undergraduates</td>
<td>18</td>
<td>Ayersman &amp; Reed (1996); Bohlin (1992); Bohlin &amp; Hunt (1995); Busch (1995); Colley et al. (1994); Crable et al. (1994); Farina (1991); Hudiburg (1990); Jones &amp; Wall (1990); Leso &amp; Peck (1992); Mawhinney &amp; Sarawat (1991); Mcinerney et al. (1990); Nelson et al. (1991); Reed &amp; Overbaugh (1993); Sigurdsson (1991); Todman &amp; Monaghan (1994); Weil &amp; Rosen (1995); Woodrow (1991)</td>
</tr>
<tr>
<td>High School students</td>
<td>5</td>
<td>Carlson &amp; Wright (1993); Okebukola (1993); Okebukola et al. (1992); Rosen et al. (1993); Weil &amp; Rosen (1995)</td>
</tr>
<tr>
<td>Student teachers</td>
<td>5</td>
<td>Ayersman &amp; Reed (1996); Liu et al. (1992); Mcinerney et al. (1990, 1994); Perkins (1993)</td>
</tr>
</tbody>
</table>

Table 2
Grouping according to measurement instruments

<table>
<thead>
<tr>
<th>Computer anxiety instruments</th>
<th>No. of studies</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosen et al. (1993)</td>
<td>4</td>
<td>Hudiburg (1990); Rosen &amp; Weil (1995); Rosen et al. (1993); Weil, Rosen &amp; Wulgalter (1990)</td>
</tr>
</tbody>
</table>
divided according to the three correlates. Because some studies investigated more than one correlate, the sum of total number of studies, for some groups was, therefore, more than what had been listed in Table 2. The number of sets of ES indicators for each meta-analysis are summarised in Table 3.

Two special arrangements were adopted in the data analysis. First, as suggested by Strube (1985), multiple results reported in a study were treated separately as independent results for analysis. For example, the study by Colley et al. (1994) investigated two types of computer experience and two different sets of $F$-values were reported. The two reported statistics were treated as two separate sets of data for analysis. In this case, two coding sheets were used to code the study. Strube (1985) suggested that meta-analysts should avoid averaging results within a study because the method of taking an average of ES indicators defeats the purpose of examining the differences and similarities among studies. This suggestion was also adopted by some researchers in their studies (e.g. Glass et al., 1981; Smith & Glass 1980). The second arrangement was that if a measurement of computer anxiety was embedded in a measure of another construct (e.g. computer attitude), this computer anxiety sub-scale was treated as an independent measure. For example, the Computer Attitude Scale (CAS) by Loyd and Gressard (1984) included a computer anxiety sub-scale. Results of this sub-scale were treated as if they were from an independent measurement tool. Lalomenia and Sidowski (1993) contended that because the Cronbach’s alpha ($\alpha$) for this computer anxiety sub-scale was as high as 0.86, it can be used as an independent measure. Some researchers (e.g. Loyd & Gressard, 1984; Siann et. al., 1990; Woodrow, 1991) also adopted this arrangement in their studies.

We only conducted meta-analysis on groups with more than three ES indicators (i.e. the bold ones in Table 3).

5. Results

5.1. Computer anxiety and gender

Meta-analysis on the relationships between computer anxiety and gender using measuring instrument as moderator variable shows inconsistent results. The

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Numbers of effect size indicators after grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderator variable</strong></td>
<td><strong>Group</strong></td>
</tr>
<tr>
<td>Instrument</td>
<td>Raub (1981)</td>
</tr>
<tr>
<td></td>
<td>Loyd &amp; Gressard (1984)</td>
</tr>
<tr>
<td>Target population</td>
<td>Undergraduate</td>
</tr>
<tr>
<td></td>
<td>Student teacher</td>
</tr>
<tr>
<td></td>
<td>High School</td>
</tr>
</tbody>
</table>
combined result of the group of studies using measures by Loyd and Gressard (1984) indicates a significant relationship, while combining results of studies using measures by Raub (1981) shows a non-significant relationship. Detailed results are presented in Tables 4 and 5.

Table 4 shows the results of the diffuse test (i.e. test of homogeneity) and combined $Z$s of two groups of studies in the instrument category. The results of the diffuse test for both groups of studies were homogeneous indicating that the two instruments (Loyd & Gressard, 1984; Raub, 1981) were generally reliable, since studies using the same instrument drew similar results. The combined $Z$s (i.e. $Z_t$) for the Raub group was non-significant, meaning that gender differences in computer anxiety are not significantly observed; whereas, the result for the Loyd and Gressard group was significant, showing that females are generally more anxious than males in the use of computers.

Table 5 shows the results of the diffuse test (i.e. test of homogeneity) and the combined $Z$s ($Z_t$) for the university undergraduates group. Meta-analysis was not conducted for the student teachers group and the high school students group due to inadequately reported statistics. The calculated value of $\chi^2 (7) = 28.44$ for the group of university undergraduates exceeds the critical value of 24.32 at $p = 0.001$. Therefore, the findings of this group of studies were considered heterogeneous. The calculated value of $Z_t$ for this group was 0.077 which was significant at $p = 0.001$. These two results indicated that for university undergraduates, females were generally more anxious than males when using computers. However, the extent to which male university undergraduates were different from the female university undergraduates on computer anxiety is still not certain. The focused test for testing the trend of the ES magnitude on the gender issue was not conducted for this group of studies due to the absence of an appropriate theory.

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of effect size indicators</th>
<th>Diffuse test</th>
<th>Combined $Z$s ($Z_t$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raub (1981)</td>
<td>4</td>
<td>$\chi^2 = 6.853^{**}$, homogeneous</td>
<td>$Z_t = -0.0172$, non-significant</td>
</tr>
<tr>
<td>Loyd &amp; Gressard (1984)</td>
<td>5</td>
<td>$\chi^2 = 10.69^{**}$, homogeneous</td>
<td>$Z_t = 0.214^{*}$, significant</td>
</tr>
</tbody>
</table>

*p < 0.005.

**$p < 0.01$.

<table>
<thead>
<tr>
<th>Group</th>
<th>No of effect size indicators</th>
<th>Diffuse test</th>
<th>Combined $Z$s ($Z_t$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University undergraduates</td>
<td>8</td>
<td>$\chi^2 = 28.44^{*}$, heterogeneous</td>
<td>$Z_t = 0.077^{*}$, significant</td>
</tr>
<tr>
<td>Student teachers</td>
<td>1</td>
<td>Not conducted</td>
<td>–</td>
</tr>
<tr>
<td>High School students</td>
<td>1</td>
<td>Not conducted</td>
<td>–</td>
</tr>
</tbody>
</table>

*p < 0.01.
5.2. Computer anxiety and computer experience

The results of meta-analysis on the relationships between computer anxiety and computer experience are consistent. Overall results indicate that computer anxiety is inversely related to computer experience. Detailed results are summarised in Tables 6 and 7. Table 6 shows results of the diffuse test (i.e. test of homogeneity), combined $Z_r$s (i.e. $Z_r$) and the focused test (i.e. $Z_f$) for three groups of studies in the instrument category.

All the computed values of the combined $Z_r$s (i.e. $Z_r$) were significant at $p=0$, indicating that computer experience was inversely related to computer anxiety. The calculated values of $\chi^2$ for the three groups far exceeded their respective critical values at $p=0.05$. Hence, the results of each of these three groups of studies were heterogeneous. This meant that even though most studies agreed that computer experience was inversely related to computer anxiety, they did not agree with one another on the extent that the two were related. These two findings imply that even though the instruments used to measure computer anxiety were generally reliable across studies investigating gender issue, they might not be as reliable across studies investigating different types of computer experience. Therefore, studies using the same instrument might be further classified based on different types of computer experience for conducting meta-analysis. The results of the diffuse test (i.e. test of homogeneity), combined $Z_r$s based on target population categorisation are summarised in Table 7. The calculated value of $\chi^2$ for the undergraduate group far

### Table 6
Computer anxiety and computer experience (based on instrument)

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of effect size indicators</th>
<th>Diffuse test</th>
<th>Combined $Z_r$s ($Z_r$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raub (1981)</td>
<td>5</td>
<td>$\chi^2 = 139.5^*$, heterogeneous</td>
<td>$Z_r = -0.319^{**}$, significant</td>
</tr>
<tr>
<td>Loyd &amp; Gressard (1984)</td>
<td>14</td>
<td>$\chi^2 = 167.5^*$, heterogeneous</td>
<td>$Z_r = -0.286^{**}$, significant</td>
</tr>
<tr>
<td>Weil &amp; Rosen (1995)</td>
<td>23</td>
<td>$\chi^2 = 96.9^*$, heterogeneous</td>
<td>$Z_r = -0.153^{**}$, significant</td>
</tr>
</tbody>
</table>

* $p < 0.01.
** $p < 0.001.

### Table 7
Computer anxiety and computer experience (based on target population)

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of effect size indicators</th>
<th>Diffuse test</th>
<th>Combined $Z_r$s ($Z_r$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University undergraduates</td>
<td>21</td>
<td>$\chi^2 = 214.7^*$, heterogeneous</td>
<td>$Z_r = -0.314^{**}$, significant</td>
</tr>
<tr>
<td>Student teachers</td>
<td>3</td>
<td>Not conducted</td>
<td>Not conducted</td>
</tr>
<tr>
<td>High School students</td>
<td>1</td>
<td>Not conducted</td>
<td>Not conducted</td>
</tr>
</tbody>
</table>

* $p < 0.01.
** $p < 0.001.
exceeded its critical value at \( p = 0.05 \). Hence, the results of this group of studies were clearly heterogeneous. The value of the combined \( Z \)'s is \( Z_c = -0.314 \), significant at \( p = 0 \), meaning computer experience is inversely related to computer anxiety for this group. Meta-analysis was not conducted for student–teacher group and high school student group due to inadequately reported statistics. Overall, the results show that computer experience is inversely related to computer anxiety. However, the extent to which they are inversely related is still uncertain.

5.3. Validity of the results

Rosenthal (1991) identified the file-drawer problem as the situation in which most of the published studies report significant effects of treatment. This is due to the fact that a researcher normally does not want to publish his/her report if he/she finds a non-significant result. To avoid this problem, Rosenthal (1991) suggested a method to estimate how many more unreported studies with non-significant results would be needed to change a meta-analytic statistic from significant to non-significant. The file-drawer problem was not a serious concern in this study, since the fail-safe \( X \) was 292 (gender), 196 (age), and 1213 (computer experience), which is greater than the respective requisite numbers, 150, 130, and 345, that Rosenthal (1991) suggests for the file-drawer problem to be a threat.

5.4. Summary of results

Findings of the meta-analysis on the gender factor indicate that female university undergraduates are generally more anxious than males university undergraduates when using computers. For the relationship between computer anxiety and computer experience, the findings show that they are inversely related. In addition, computer anxiety measuring instruments are generally found to be reliable across studies investigating gender issue, but not as reliable across studies investigating different types of computer experience. Therefore, besides measuring instruments and type of target population, type of computer experience can also be a good moderator for future meta-analysis.

6. Discussion

In this section we discuss: (1) limitations of this meta-analysis; (2) implications and suggestions for future studies.

6.1. Limitations

There are at least two limitations of this study. They are: (1) qualities of the collected studies were not graded; and (2) numbers of studies for conducting meta-analysis were small. Ideally, qualities of studies should be graded when conducting an effective meta-analysis. However, due to the time constraint in this meta-analysis,
the collected studies were weighed by their sample size ($n$) in spite of their qualities. That is, both the internal and external validity and reliability of the ES indicators ($r$s) were not relatively graded. Findings of poor studies with large sample size may contribute more to the analysis than those 'good' studies with small sample sizes. Although an extensive data collection procedure had been carried out, there were only a small number of studies which were suitable for meta-analysis. Recall that the two inclusion criteria were: (1) studies which took computer anxiety as the dependent variable and investigated the relationships with at least one of the three correlates; and (2) studies which provided quantitative statistical results of the above relationships. We collected 60 related studies altogether, which were published between 1990 and 1996. Of these, 36 studies were included. Of those rejected, six were review studies, one contained no statistical results, three took computer anxiety as an independent variable, and the remaining 14 failed to meet either one of the two inclusion criteria.

6.2. Implications and suggestions for future studies

There are two implications of the findings and six suggestions for future studies. Two major implications of the findings are: (1) computer anxiety can be reduced using appropriate measures; and (2) course instructors in technology-based classrooms should make a concerted effort to minimise gender differences in computer use. Based on these implications, some suggestions for future studies are: (1) developing methods to reduce computer anxiety; (2) developing instruments to measure computer anxiety; (3) replicating studies with more rigorous methodology; (4) investigating the relationship between gender and computer anxiety; (5) reviewing the relationships between computer anxiety and other correlates; and (6) developing new meta-analysis methods.

6.2.1. Implications for reducing computer anxiety

There are three implications on this aspect. Firstly, since computer anxiety is not a trait anxiety and it has various dimensions (e.g. computer equipment anxiety and computer learning anxiety), we may safely assume that it can be changed or reduced along these various dimensions. This means that when we plan computer anxiety reduction programmes, we should take into consideration the different dimensions of anxiety sources and not just learning anxiety alone. Perhaps, a needs assessment can be conducted to find out relevant dimensions of anxiety which should be considered in planning the anxiety reduction programmes. Secondly, since computer anxiety causes computer use avoidance, educators should handle this problem before they can successfully implement instructional programmes with technology. This implies that the designers of instructional programmes with technology components should take note of features that could cause computer anxiety and look into measures to minimise it. Thirdly, since increasing computer experience will reduce computer anxiety, all the more, we should encourage more exposure to computers with the use of software which can be used to reduce computer anxiety.
6.2.2. Implications for gender differences in computer use

The finding that female university undergraduates are generally more anxious than their male counterparts when using computers implies that course instructors in universities should be aware of the gender differences in computer anxiety when designing courses. They should avoid using computer software which is prone to gender biases. For example, some software which use war game-like features are more male-oriented and, therefore, the use of this type of software could be more advantageous to male learners. In addition, instructors should provide more help, guidance, and support to female learners.

6.2.3. Developing instruments to measure computer anxiety

Results of this meta-analysis indicated that instruments measuring computer anxiety are generally reliable, but not compatible. Future studies may focus on validating these instruments, perhaps looking into the development of new computer anxiety measuring instruments which are based on a commonly agreed operational definition.

6.2.4. Replicating studies with more rigorous methodology

The number of studies excluded from the meta-analysis speaks to the methodological weakness of research in this area. It indicates that replication of studies using more rigorous methodology is desirable. For example, future studies may adopt appropriate sample selection procedures, administer statistical tests for making claims, and interpret findings of their studies clearly and precisely.

6.2.5. Investigating the relationship between gender and computer anxiety

This meta-analysis only indicates that female university undergraduates are generally more anxious than their male counterparts when using computers. It does not submit to the claim that the gender factor, in general, is related to computer anxiety based on studies published in the 1990s (refer to Table 4). Therefore, future studies may continue to investigate the gender issue in conjunction with moderating variables contributing to the inconsistency of previous findings. For example, the instrument may be a potential moderating variable, which contributes to the inconsistency. Future studies may use the same measuring instrument that is not prone to gender biases to investigate the gender issue in different types of target population.

6.2.6. Reviewing the relationships between computer anxiety and other correlates

There are many other correlates which have been investigated by previous studies. This review only examined three common correlates. Other correlates such as maths anxiety, test anxiety, locus of control, and educational level were excluded. The increased scope in future reviews will enable researchers to draw stronger conclusions and more relevant implications.

6.2.7. Developing new meta-analysis methods

Future meta-analysts may look into the methodology for investigating the interactive effect of two variables. Researchers have queries upon whether there is a way
to summarise the interactive effect of gender on the relationship between computer experience and computer anxiety. These kinds of relationships were not investigated in this study due to a lack of an appropriate method.

7. Conclusion

In conclusion, future studies of computer anxiety may develop methods for reducing computer anxiety, investigating in depth the relationships between computer anxiety and its other correlates. In addition, there is also a need to develop a reliable computer anxiety measuring instrument based on a commonly accepted operational definition to be used by future studies. Meta-analysts are called to develop new methods for summarising interactive effects among variables.

References


