

**Up on Cloud Canine: Things Look Paw-sitive With a Dog Around. The Benefit of
Canine Assisted Intervention on the Mental Health of Higher Education Students**

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A thesis submitted to Middlesex University in fulfilment of the requirements for
the degree of Doctor of Philosophy

School of Science and Technology

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December 2021

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Abstract

Up on Cloud Canine: Things Look Paw-sitive With a Dog Around. The Benefit of Canine Assisted Intervention on the Mental Health of Higher Education Students

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The concept of good mental health is one that is lacking in students enrolled in Higher Education (HE). Experiencing mental health issues is common for many students and as a result of this they struggle during their time in academia. This thesis presents three studies that investigate the benefits of Canine Assisted Intervention (CAI) on the mental health of HE students. Study 1 demonstrates a 10 minute CAI session reduces anxiety and stress levels in a CAI group in comparison to a control group. Study 2 extends this by showing a reduction in depression alongside anxiety and stress and identified no difference in the impact of CAI on a 2 minute, a 5 minute or a 10 minute session when compared to a control group. Study 2 also demonstrated that the form of interaction between canine and human had no impact on CAI, and that a negative correlation was observed between the cuteness of the canine and anxiety levels, and the cuddliness of the canine and stress levels. Finally, study 3 explored, and found no impact of social interaction on the effectiveness of CAI. Instead, it was the simple act of interacting with a canine that was the contributing factor in reducing anxiety, stress, and depression levels, and in increasing general well-being. In addition, attachment style had no impact on the effects of CAI when taking part in a trio, however when interacting with a canine alone, having a proximity seeking style predicted post-depression levels. Study 3 also demonstrated that when experiencing CAI in pairs, an insecure attachment style predicted post cheerfulness and feeling loved, and both insecure and proximity seeking styles predicted post confidence and relaxation.

The findings are important as they demonstrate that the length of CAI (2,5,10 minutes), the level of interaction between canine and human, and social environment have no impact on the effectiveness of CAI. Rather it is simply interacting with a canine that is key to reducing anxiety, stress, and depression levels and in increasing well-being. These results contribute toward CAI being an inexpensive and economical approach for universities hoping to address the mental health issues experienced by students during their time in HE.

Acknowledgements

First and foremost, I owe the biggest and fattest of thanks to my supervisor Dr. Gemma Reynolds. I say this quite often, but I literally could not have done this without you, your support, or guidance, and could not have wished for a better, more gracious, or patient supervisor. There are a great many resources that contributed to this thesis, but you are by far the most valued one. Amelie and Maddie are very lucky to have you as their Mum! (girls, thank you for sharing). A second and no less big fat thank you to Dr. Mark Coulson, my second supervisor, for his feedback and support (and coffee during stats sessions). Thank you to Prof. Tom Dickins and Kirsty Neller for their help with observation work, and to all the many students that agreed to take part in my research.

To Hilary Norman and Sarah Welland, my fellow PhD students, thank you for your friendship, the coffee, chats, messages and catch up's we had pre, during and post pandemic, you ladies rock my PhD world! To my dearest friends Mariko Jesse, and Dr. Naazneen "Max" Barma, thank you for always believing I could do this, even when I was painting nails for a living and couldn't spell academia let alone consider a career in it. Your friendship makes my heart happy and I am eternally grateful for this (Max, I tried so hard to get your work into my thesis but it turns out political order in post-conflict states has nothing to do with the benefit of canine interaction).

My appreciation and thanks to Disha and Trishna Daswaney for the keys to your home so Dahlia could take part anytime and love always to Tia. Thanks also to Raphi Labi, CEO of K9 Consulting for providing canine training and canine related advice.

To those who supported me while I thought of impossible things, I thank you, and finally, to Colin and Elvis, aka Fathead. Your generosity, encouragement, support, trapeze classes (Colin, not Fathead), face licks and doggyness (Fathead, not Colin) have been invaluable during this time.

Table of Contents

Acknowledgements	iv
Research Publications and Conference Presentations	xii
Conferences	xiii
List of Tables and Figures	xiv
<u>Chapter 1 - Litreature Review</u>	<u>19</u>
Part 1	20
1.1 Mental Health Issues in Higher Education Students	20
1.1.1 Financial Issues.....	22
1.1.2 Academic Issues	24
1.1.3 Transitional Issues	25
1.1.4 Current Mental Health Support for HE Students.....	26
Part 2	29
1.2 Introduction to Animal Interventions	29
1.2.1 Terms of Use	30
1.3 Canine Assisted Intervention	32
1.3.1 Use of Canine Assisted Intervention in Education.....	33
1.3.2 Canine Assisted Intervention in School Children.....	33
1.4 Canine Assisted Intervention in Higher Education	37
1.5 Systematic Review	39
1.5.1 Methods	39
1.5.1.1. Literature search	39
1.5.1.2 Study Selection	39
1.5.1.3 Data Extraction	42
1.5.1.4 Assessment of Study Quality.....	42
1.5.2 Results	43
1.5.2.1 Terminology	43
1.5.2.2. Sample	44
1.5.2.3 Canine.....	44
1.5.2.4 Study design	45
1.5.2.5 Study Location.....	46
1.5.2.6 Measures and instruments	46

1.5.2.7 Intervention duration	48
1.5.2.8 Intervention activity	48
1.5.3 Discussion	49
1.5.3.1 Outcome One: Mental Health Benefits.....	50
Effects of CAI on Anxiety	50
Effects of CAI on Stress.	55
Effects of CAI on Depression.	59
1.5.3.2 Outcome Two: Social benefits.....	60
1.5.4 Issues with CAI Research	63
1.5.4.1 Methodological Limitations	64
Lack of Control Groups.	64
Lack of Randomised Control Trial Design.....	64
Intervention Duration.....	65
Handler Effects on Canine Assisted Intervention.....	65
Study location.	67
Measures.	67
Participants.....	67
Dropout rates.....	68
1.5.5 Theoretical Framework	68
1.5.6 Summary	70
1.5.6 The Current Thesis.....	72
1.5.6.1 Thesis Aim.....	72
1.5.6.2 Structure of the Current Thesis.....	72
Chapter 2 - Methodology	72
Chapter 3 - Study 1: A Randomised Controlled Trial Investigating the Effects of Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students.	73
Chapter 4 - Study 2: A Randomised Controlled Trial Demonstrating the Effectiveness of Brief Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students. 73	
Chapter 5 - Study 3: Grouped Canine Assisted Intervention No More Effective Than Individual Participation: An Exploration of Canine Assisted Intervention Participation on Higher Education Student Mental Health.	74
Chapter 6 - Discussion.....	74
<u>Chapter 2 - Methodology.....</u>	<u>75</u>
2.1 Summary of Aims	76
2.2 Research Approach	76

2.2.1 Ethics	78
2.2.2 Safeguarding Human Participants	78
2.2.3 Safeguarding Canines	79
2.2.4 Participants	79
2.3 Materials.....	81
2.3.1 Measures	81
Visual Analogue Scales (VAS).....	81
Anxiety, Stress and Depression	81
Visual Analogue Scales Well-being. VAS-Optimism, Confidence, Cheerfulness, Relaxation, Feeling Loved	82
Visual Analogue Scales Canine Traits.....	82
The Depression, Anxiety, Stress Scale (DASS).....	83
The Depression, Anxiety, Stress Scale.....	83
Anxiety.....	83
The Depression, Anxiety, Stress Scale	83
Visual Analogue Scales	83
State Trait Anxiety Inventory	84
Stress.....	84
The Depression, Anxiety, Stress Scale	84
Visual Analogue Scales - Stress.....	84
Perceived Stress Scale.....	84
Depression.....	85
Visual Analogue Scales - Depression	85
The Depression, Anxiety, Stress Scale	85
Becks Depression Inventory	85
Well-being.....	85
Checklist Individual	85
Ryff Scale of Psychological Well-being.....	86
Warwick-Edinburgh Mental Wellbeing Scales.....	86
Personal Well-Being Index	87
Interaction Style.....	87
Vulnerable Attachment Style Questionnaire.....	87
Rational for Measures Used.....	88
2.3.2 Variables.....	89
2.3.3 Canine.....	90
2.3.4 Location.....	92
2.3.5 Hardware.....	92
2.3.6 Software.....	93
2.3.7 Procedure.....	93
General procedure.....	93

2.4 Data Analyses.....	95
-------------------------------	-----------

Chapter 3 - Study 1.....97

A Randomised Controlled Trial Investigating the Effects of Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students *	98
--	-----------

3.1 Method.....	99
------------------------	-----------

3.1.1 Participants	99
3.1.2 Materials	100
3.1.3 Questionnaire Measures.....	100

3.2 Procedure	102
----------------------------	------------

3.3 Results.....	102
-------------------------	------------

3.3.1 Statistical analysis.....	102
3.3.2 Pre-existing Differences	108
3.3.3 Correlation Analyses	108
3.3.4 Anxiety	109
3.3.5 Stress.....	112
3.3.5 Depression	114
3.3.7 Checklist Individual Strength (CIS)	117
3.3.8 Ryff Scales of Psychological Well-being (RYFF)	118

3.4 Discussion	120
-----------------------------	------------

Chapter 4 - Study 2.....124

A Randomised Controlled Trial Demonstrating the Effectiveness of Brief Canine Assisted Intervention on Anxiety, Stress, Depression and Well-Being in Higher Education Students.....	125
--	------------

4.1 Method.....	127
------------------------	------------

4.1.1 Participants	127
4.1.2 Materials	128
4.1.3 Canines	128
4.1.4 Observation Software	129
4.1.5 Questionnaire Measures.....	129

4.2 Procedure	131
----------------------------	------------

4.3 Results.....	132
4.3.1 Statistical Analysis	132
4.3.2 Preliminary Analyses.....	135
4.3.3 Correlation Analyses	135
4.3.4 Anxiety	136
4.3.5 Stress.....	139
4.3.6 Depression	141
4.3.7 Well-Being.....	143
4.3.8 Interaction Style.....	144
Anxiety.....	144
Stress.....	145
Depression.....	146
Well-being.....	146
4.3.9 Canine traits.....	147
4.4 Discussion.....	148

Chapter 5 - Study 3.....154

Grouped Canine Assisted Intervention No More Effective Than Individual Participation: An Exploration of Canine Assisted Intervention Participation on Higher Education Student Mental Health 155

5.1 Method.....	159
5.1.1 Participants	159
5.1.2 Materials	160
5.1.3 Canine.....	160
5.1.4 Questionnaire measures.....	160
5.2 Procedure	161
5.3 Results.....	163
5.3.1 Statistical Analysis	163
5.3.2 Preliminary Analysis	166
5.3.3 Pre-existing differences	166
5.3.4 Correlation Analyses	166
5.3.5 Anxiety	168
5.3.6 Stress.....	169
5.3.7 Depression	170
5.3.8 Visual Analogues Scales - Well-being	171

Optimism.....	171
Confidence.....	173
Cheerfulness.....	173
Relaxation.....	174
Feeling Loved.....	174
5.3.9 Personal Wellbeing Index.....	174
5.3.10 VASQ.....	176
Individual CAI Group.....	176
Depression.....	176
Paired CAI Group.....	177
Confidence.....	177
Cheerfulness.....	177
Relaxation.....	178
Feeling Loved.....	178
5.4 Discussion.....	179
<u>Chapter 6 - General Discussion.....</u>	<u>184</u>
General Discission.....	185
6.1 Overview of the aims.....	185
6.2 Summary of the findings.....	186
6.2.1 Study 1.....	186
Implications for Canine Assisted Intervention.....	188
6.2.2 Study 2.....	189
Implications for Canine Assisted Intervention.....	190
6.2.3 Study 3.....	192
Implications for Canine Assisted Intervention.....	193
6.3 Strengths of the Thesis.....	194
6.3.1 RCT.....	194
6.3.2 Duration.....	194
6.3.3 Interaction activity.....	194
6.3.4 Social environment.....	195
6.3.5 Depression.....	195
6.3.6 Location.....	195
6.4 Framework for Canine Assisted Intervention.....	196
6.4.1 Participant.....	197
6.4.2 Social Environment.....	198
6.4.3 Duration.....	198

6.4.4 Interaction	198
6.4.5 Location	198
6.4.6 Handler	198
6.4.7 Canine	199
6.4.8 Limitations	201
6.4.9 Recruitment	201
6.4.10 Participants	201
6.4.11 Canine participation.....	202
6.4.12 Gender balance	202
6.4.13 Self reporting measures	202
6.4.14 Strong correlations between anxiety, stress, and depression.....	202
6.5 Implications for future work	204
6.5.1 Depression	204
6.5.2 Well-Being.....	206
6.5.3 Group size.....	207
6.5.4 Canines	207
6.5.5 The impact of long-term studies	208
6.5.6 Intervention Activity.....	208
6.5.7 Single Canine Assisted Intervention session	209
6.6 Conclusion	209
References	211
Appendices	255

Research Publications and Conference Presentations

Journal Publications

Manville, K., Coulson, M., & Reynolds, G. (2020). Canine Assisted Intervention - the impact of intervention duration on reducing anxiety, stress and depression in Higher Education Students: a randomised trial. *Middlesex University, Work Based Learning e-Journal International*, 9(2b). https://wblearning-ejournal.com/uploads/text_with_images/3.4karenmanvillecanineassistedinterventiontheimpactofinterventiondurationonreducinganxiety1614004861.pdf

Manville, K., Coulson, M., & Reynolds, G. (in press). Canine-assisted intervention reduces anxiety and stress in Higher Education students: A randomised controlled trial. *Society and Animals*.

Manville, K., Coulson, M., Mulqueen, M., A., Neller, K., Searing, C., Welland, S., & Reynolds, G. (under review). Effects of Canine-Assisted Intervention on the Mental Health of Higher Education students: a systematic review. *Journal of Further and Higher Education*.

Conferences

Manville, K., Coulson, M., & Reynolds, G. (2018). A controlled trial exploring the effect of canine interaction on higher education student's emotional well-being. *Study presented at the University of Worcester Postgraduate Research Conference: Seeds of Knowledge Conference*, University of Worcester, July 2018.

Manville, K., Coulson, M., & Reynolds, G. (2018). A randomised controlled trial exploring the effect of canine interaction on higher education student's emotional well-being. *Study presented at The British Psychology Society Division of Health Conference 2018*, Newcastle, September 2019.

Manville, K., Coulson, M., & Reynolds, G. (2019). Title: A randomised controlled trial exploring the effect of canine interaction on the emotional wellbeing of higher education students. *Study presented at The Middlesex University London Research Students Annual Summer Conference*, London, 2019.

Manville, K., Coulson, M., & Reynolds, G. (2020). A RCT exploring the importance of the duration of canine interaction in improving Higher Education student wellbeing. *Accepted to present at The British Psychology Society Division of Health Conference 2018*, Bristol, June 2020*.

Manville, K., Coulson, M., & Reynolds, G. (2021). Grouped Canine Assisted Intervention No More Effective Than Individual Participation: An Exploration of Canine Assisted Intervention Participation on Higher Education Student Mental Health. *Submitted to present at The British Psychology Society Division of Health Conference, 2022.*

List of Tables and Figures

Tables

Page 255	<u>Table 1</u>	Summary of First Author and Date, Terminology, Sample Size, Participant Age, Number of Sessions, Timing, Group Numbers, Canine Per Group, Study Design, Measures Used, Intervention Activity, Outcome Post Intervention and Study Quality.
Page 47	<u>Table 2</u>	Full List of Standardised Measures Used Including Measure and the Number of Items per Measure
Page 80	<u>Table 3</u>	Participants Demographics Details of All Three Studies Including Age, Gender, Whether They Had a Canine at Home and Ethnicity
Page 104	<u>Table 4</u>	Correlation Between all Measures at Pre-Intervention
Page 106	<u>Table 5</u>	Correlations Between all Measures at Post-Intervention
Page 118	<u>Table 6</u>	CIS Mean Scores (and SD) Pre-to-Post Intervention Scores for CAI and the Control Group
Page 119	<u>Table 7</u>	RYFF Mean Scores (and SD) Pre-to-Post Intervention Scores for CAI and the Control Group
Page 133	<u>Table 8</u>	Correlation Between all Measures at Pre-Intervention
Page 134	<u>Table 9</u>	Correlations Between all Measures at Post-Intervention
Page 148	<u>Table 10</u>	Correlation Between all Measures and Canine Traits
Page 164	<u>Table 11</u>	Correlation Between all Measures at Pre-Intervention
Page 165	<u>Table 12</u>	Correlation Between all Measures at Post-Intervention
Page 172	<u>Table 13</u>	Pre and Post-Intervention Mean Scores and SD for the Individual CAI Group, the Paired CAI Group and the Trio CAI Group for the VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation and VAS-Feeling Loved

Figures

Page 23	<u>Figure 1</u>	HE Student Mental Health Issues
Page 41	<u>Figure 2</u>	PRISMA Flow Diagram
Page 91	<u>Figure 3</u>	Elvis the Dog Used During the Interaction in the CAI Groups in Studies 1 and 2
Page 92	<u>Figure 4</u>	Dahlia the Dog Used During the Intervention in the CAI Groups in Studies 2 and 3
Page 110	<u>Figure 5a</u>	Pre and Post Mean VAS-Anxiety Scores (with SE bars) for the CAI and Control Group
Page 111	<u>Figure 5b</u>	Pre and Post Mean STAI Scores (with SE bars) for the CAI and Control Group
Page 111	<u>Figure 5c</u>	Pre and Post Mean DASS-Anxiety Scores (with SE bars) for the CAI and Control Group
Page 113	<u>Figure 6a</u>	Pre and Post Mean VAS-Stress Scores (with SE bars) for the CAI and Control Group
Page 113	<u>Figure 6b</u>	Pre and post Mean DASS-Stress Scores (with SE bars) for the CAI and Control Group
Page 115	<u>Figure 7a</u>	Pre and Post Mean VAS-Depression Scores (with SE bars) for the CAI and Control Group
Page 116	<u>Figure 7b</u>	Pre and Post Mean BDI Scores (with SE bars) for the CAI and Control Group
Page 116	<u>Figure 7c</u>	Pre and Post Mean DASS-Depression Scores (with SE bars) for the CAI and Control Group
Page 138	<u>Figure 8a</u>	Pre and Post Mean VAS-Anxiety Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group
Page 138	<u>Figure 8b</u>	Pre and Post Mean STAI Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group
Page 140	<u>Figure 9a</u>	Pre and Post Mean VAS-Stress Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group

Page 140	<u>Figure 9b</u>	Pre and Post Mean PSS scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI and 10 Minute CAI and Control Group
Page 142	<u>Figure 10a</u>	Pre and Post Mean VAS-Depression Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group
Page 142	<u>Figure 10b</u>	Pre and Post Mean BDI Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI and 10 Minute CAI and Control Group
Page 143	<u>Figure 11</u>	Pre and Post Mean WEBWBS Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group
Page 168	<u>Figure 12</u>	Pre and Post Mean VAS-Anxiety Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group
Page 169	<u>Figure 13</u>	Pre and Post Mean VAS-Stress Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group
Page 170	<u>Figure 14</u>	Pre and Post Mean VAS-Depression Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group
Page 175	<u>Figure 15</u>	Pre and Post Mean PWI Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group
Page 200	<u>Figure 16</u>	Plain Language Flyer for CAI Framework

Appendices

Page 255	<u>Appendix A</u>	Table 1. Summary of First Author and Date, Terminology, Sample Size, Participant Age, Number of Sessions, Timing, Group Numbers, Canine Per Group, Study Design, Measures Used, Intervention Activity, Outcome Post Intervention and Study Quality
Page 271	<u>Appendix B</u>	Ethical approval from Psychology Research Ethics Committee at Middlesex University. Study 1,2,3
Page 274	<u>Appendix C</u>	Visual Analogue Scale - Anxiety, Stress, Depression
Page 275	<u>Appendix D</u>	Visual Analogue Scales - Well-being
Page 276	<u>Appendix E</u>	Visual Analogue Scale - Canine Trait
Page 278	<u>Appendix F</u>	The Depression, Anxiety, Stress Scale - 21
Page 280	<u>Appendix G</u>	State Trait Anxiety Inventory
Page 281	<u>Appendix H</u>	Perceived Stress Scale
Page 282	<u>Appendix I</u>	Becks Depression Inventory
Page 286	<u>Appendix J</u>	Checklist Individual Strength
Page 288	<u>Appendix K</u>	Ryff Scales of Psychological Well-Being
Page 291	<u>Appendix L</u>	Warwick-Edinburgh Mental Well-being Scale
Page 292	<u>Appendix M</u>	Personal Wellbeing Index
Page 294	<u>Appendix N</u>	Vulnerable Attachment Style Questionnaire

Abbreviations

AAA	Animal Assisted Activity
AAI	Animal Assisted Intervention
AAT	Animal Assisted Therapy
ART	Attention Restoration Therapy
BDI	Becks Depression Inventory
BP	Blood Pressure
CAI	Canine Assisted Intervention
CIS	Checklist Individual Strength
DASS-21	Depression, Anxiety, Stress Scale - 21
DASS	Depression, Anxiety, Stress Scale
DfE	Department for Education
HAI	Human Animal Intervention
HRV	Heart Rate Variability
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HR	Heart Rate
NUS	National Union for Students
NHS	National Health Service
PSS	Perceived Stress Scale
PWI	Personal Well-being Index
RCT	Randomised Control Trial
RYFF	Ryff Scales of Psychological Well-being
SMHA	Student Mental Health Agreement
sNGF	Saliva Nerve Growth Factor
STAI	State Trait Anxiety Inventory
UK	United Kingdom
VAS	Visual Analogue Scale
VAS-CT	Visual Analogue Scale - Canine Trait
VASQ	Vulnerable Attachment Style Questionnaire
WEMWBS	Warwick-Edinburgh Mental Well-being Scale

Chapter 1

Literature Review

Part 1

1.1 Mental Health Issues in Higher Education Students

One in four people suffer from common mental health problems (Garrido-Cumbrera et al., 2018), with adolescents being at high risk (Lawrence et al., 2015; Ogden & Hagen, 2014). Andrews and Wilding (2004) found that 9% of students without signs of depression prior to enrolment in higher education (HE) developed clinical depression mid-way through the course, and 20% suffered clinically significant anxiety levels during their time in HE. Richardson et al. (2015) revealed that 17% of United Kingdom (UK) university students suffered from depression and a further 12% experienced an anxiety disorder. One point of concern is that these studies only identify clinically significant depression and anxiety. These prevalence rates would be alarmingly higher if they also considered subclinical conditions.

Over the last decade there has been a rise in the global concern for the mental health needs of university students (e.g., Leung, 2017; Prince, 2015; Usher & Curran, 2017). In the UK, the House of Commons (2020) reported 33.9% of students experienced serious psychological issues which they felt required professional advice. In a recent university student mental health survey (The Insight Network, 2020), 42.3% of respondents reported experiencing some form of mental health issue requiring similar help. This is an 8% increase on the previous year's report which saw an increase of 9% from the year before (The Insight Network, 2019). The 2020 report also found that the most prevalent issues were depression experienced by 12% of respondents (10.2% in 2019) and anxiety at 11.2% (8.4% in 2019).

Issues in HE student well-being such as debt, financial worry and stress, and the impact of these on retention rates are a concern (Britt et al., 2017), however this is not a new issue. In 1933 Angell (as cited in Davy, 1960) claimed that between 10-15% of students experienced what he called *emotional or personality difficulties* which had an effect on their happiness, and Davy (1957) himself found 43% of undergraduates were classed as being anxious. Gunn (1970) suggested the stress experienced by university students was complex citing issues with transitioning from school to university, difficulties

with their families, sexual conflict, and loneliness as the main four issues. Fast forward to 40 years later and the issues of anxiety and stress in university students is still an issue as demonstrated by Eisenberg et al. (2007) who found that 15.6% of the undergraduate students who took part were identified as having either an anxiety or depressive disorder. Anxiety is cited as being the most common issue in university students, followed by depression (Pedrelli et al., 2015), with Beiter et al., (2015) suggesting that almost 10% of HE students had either been diagnosed with, or received support with depression. Beiter et al.'s (2015) own results demonstrated 38% of respondents had experienced some form of stress ranging from mild to severe, 40% experiencing anxiety ranging from mild to severe, and 33% of respondents experienced mild to severe depression. Furthermore, Thorley (2017) reported that 15,395 first year students in the UK revealed they struggled with a mental health issue. More recently the current pandemic has added to student mental health issues with Son et al., (2020) reporting that 71% of students surveyed felt Covid-19 had increased their stress, anxiety and depressive thoughts. In another study, Kaparounaki et al., (2020) found that lockdown had a negative impact on HE student mental health resulting in an increase in anxiety (73%) and depression (60.9%).

HE students may experience periods of stress for a range of reasons (e.g., see Saleh et al., 2017). Specifically, Brown (2016) reports that increased tuition fees and student loans, alongside negative consequences of social media can increase risk of mental health issues in the current generation of university students. HE students may also experience greater levels of stress, anxiety and depression than previous generations due to factors such as increased living costs or a lack of employment (Eisenberg et al., 2007; Richardson et al., 2015). In addition, it has been suggested university students are at an age in which mental health issues are most likely to manifest (Richardson et al., 2015), a stage whereby young adults transitioning from childhood to adulthood poses an additional developmental challenge (Hunt & Eisenberg, 2009). Alongside anxiety and stress, it has also been documented that students struggle with depression during their time enrolled in HE (Al-Qaisy, 2011; Dahlin et al., 2005; Eisenberg et al., 2007). There is also evidence to suggest that depression in HE students was higher

than the general population (Dahlin et al., 2005; Ibrahim et al., 2012), with Al-Qaisy (2011) concluding there was a negative relationship between depression and academic achievement.

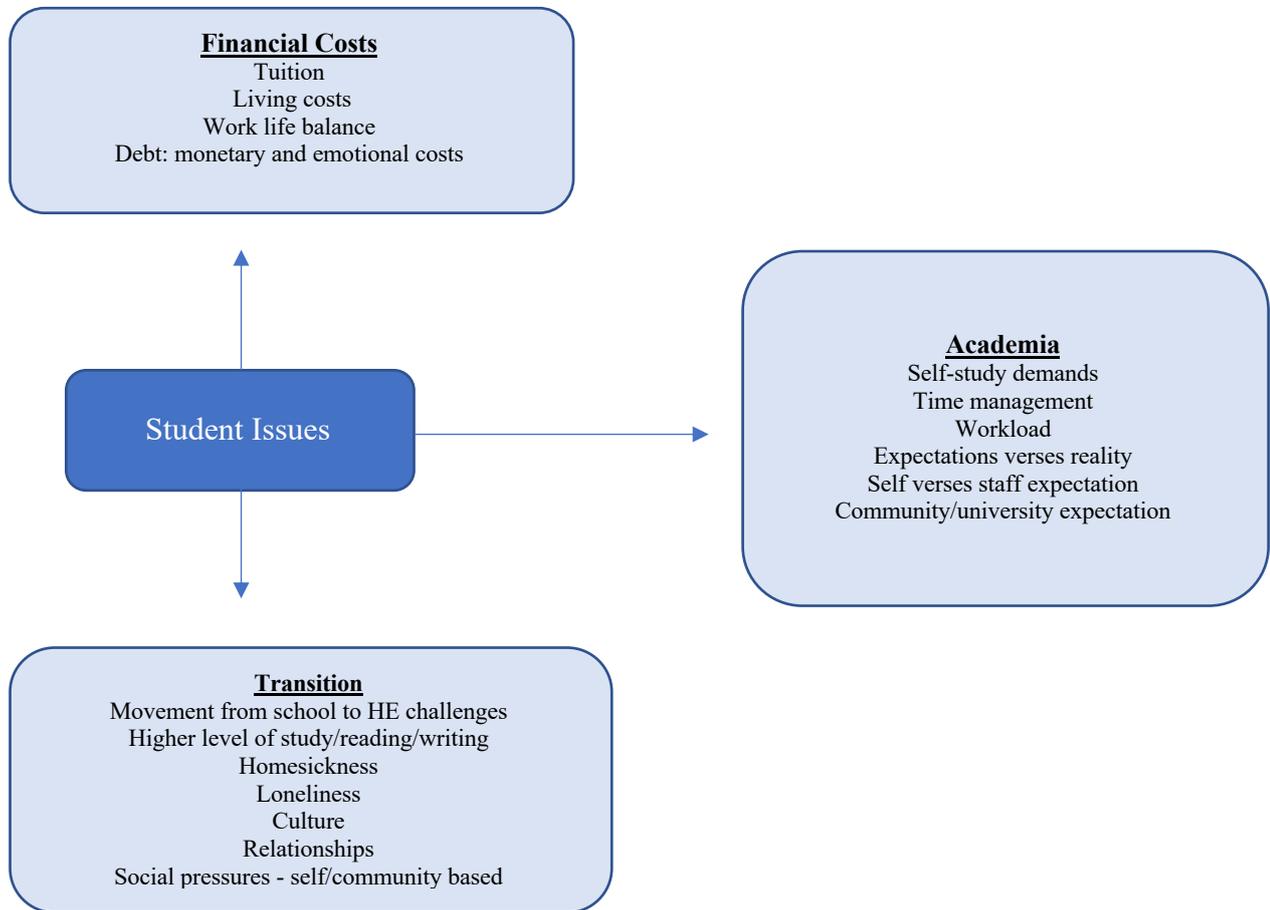
The main issues students face during their time in higher education can be categorised into three main areas: financial, academic, and transitional [Figure 1]).

1.1.1 Financial Issues

Financial issues include tuition fees, cost of living and debt, and managing work life balance (e.g., Brown, 2016; Richardson et al., 2015; Roberts et al., 2000). Broglia et al., (2017) argued the increase of annual student fees in the UK from £3,290 to £6,000 and then £9,000 had a negative impact on student mental health. According to Richardson (2011), students concerned with debt suffer from poorer mental health than their peers resulting in a negative impact on academic performance. In an earlier study, Roberts et al. (2000) suggested that students with a lower income were often predicted to struggle with anxiety and depression. In addition, they reported students considered abandoning their studies due to financial concerns with others turning to criminal activities such as prostitution and drug dealing to provide financial support. That students would abandon their studies due to mounting debt is somewhat understandable, but to turn to criminal activity to cover this debt indicates serious issues that should not be ignored. In a more recent study, Richardson et al. (2017) found mental health issues including anxiety, stress and depression were negatively affected by financial difficulties including debt and their abilities to pay bills.

Figure 1

HE Student Mental Health Issues



1.1.2 Academic Issues

The second issue concerns academic stressors including the pressure from universities to attend, learning under new and different circumstances, and keeping up with peers. These are important as they can have a negative impact on academic achievement (Binfet & Passmore, 2016; Eisenberg et al., 2009; Sun et al., 2016), as well as physical health while also increasing the likelihood of suicide (Eisenberg et al., 2007). The fear of academic failure is a contributor of student stress (Bhujade, 2017) and Reddy et al. (2018) discusses how poor time management and high levels of assignments can also contribute to student stress levels. Self-expectations, expectations of university life, and those from staff have also been cited as contributors to poor mental health (e.g., Adams et al., 2017; Brown, 2016; Feldman et al., 2016; Hyun et al., 2006), with the academic transition from secondary education to HE contributing towards students anxiety levels (Hassel & Ridout, 2018)

It has been suggested that students are not always prepared for the academic requirements of university (Mah & Ifenthaler, 2018). Many first year students assume university will be similar to school, a continuation of what they already know or have experienced. The reality is that the contact students have with staff during classes, staff availability (to the student), class sizes and workload differ greatly to earlier education (Lowe & Cook, 2003). Students also struggle with the detail in lecture material, the large lecture sizes and that they felt the responsibility for learning lay with staff, not themselves (Hassel & Ridout, 2018). The authors also argued incoming students had issues with managing workload, the demands of learning in HE and developing an independent learning style rather than having teachers available to support them. Interestingly, while lecturers expected students to attend all teaching sessions and associated success with attendance, students did not place the same value in attendance or feel that academic success could be affected by attendance (Hassel & Ridout, 2018). In an effort to understand new students' anxieties, the University of Lincoln in conjunction with the Office for Students took part in a National Gain project (Speight & Walker, 2018). Fifty nine percent of first year students took part in the survey and comments made ranged from the number of different subjects

they had to study versus the exception of just one and the level of independence and self-directed study that was required. Contact time with, and availability of staff, workload and class size were also misunderstood by incoming students (Hassel & Ridout, 2018).

1.1.3 Transitional Issues

The final set of issues refer to difficulties with the transitional period, including homesickness, adjusting to college life and societal pressure (Ang & Liamputtong, 2008; Binfet & Passmore, 2016; Brown, 2016, Feldman et al., 2016; Soet & Sevig, 2006; Thurber & Walton, 2012). Starting university is often portrayed as a positive move inducing feelings of excitement and new expectations (Binfet & Passmore, 2016; Feldman et al., 2016). However the transition from understanding how to participate within a known model to one where different rules must be learned and understood can often bring about stress and anxiety in first year students (Binfet & Passmore, 2016; Crump & Derting, 2015).

It has also been suggested (Brown, 2016) that the stress of having to adapt to new surroundings or circumstances, including moving away from home and existing support networks with people one has never met can cause mental health issues. For other students, this transition is not simply moving away from home to university in the same country, but as experienced by international students, learning about a new culture and adapting to the norms and customs of their new country (Ang & Liamputtong, 2008). Pressure placed on students from their family and immediate communities can also contribute towards mental health issues (Murayama et al., 2016; Wang & Heppner, 2002) with Agliata and Renk (2008) reporting students felt they were not meeting their parents' expectations of them at university and as a result of this had difficulties adjusting.

Homesickness is another emotion many first year students experience that may exacerbate negative emotions (Binfet & Passmore, 2016; Thurber & Walton, 2012). Homesickness is considered by some as a form of grief (Stroebe et al., 2015) which can bring about feelings of unhappiness and of being disoriented when finding oneself in a new environment. While homesickness generally

diminishes over time, it can have a negative impact on other areas of HE including academia and making new friends or relationships (English et al., 2017). In some cases, it may also encourage coping strategies in the form of unhealthy behaviour including binge drinking or drug use (e.g., English et al., 2017; Thurber & Walton, 2012). This could have a negative impact on student experience and academic achievement leading to withdrawal and social isolation (Binfet & Passmore, 2016).

Social anxiety and pressure can also be a contributing factor to student well-being and mental health issues (Adams et al., 2017; Soet & Sevig, 2006). Scanlon et al. (2007) proposed the process of losing one's identity in the first year of university and trying to rebuild this into a new identity based on new circumstances contributed to mental health issues. The need to feel a sense of belonging at university can often cause concern (Read et al., 2010), while anxiety relating to not fitting in or feeling lonely, as well as the fear of social isolation, can cause students to form any relationship regardless of the benefit just to ensure they are not lonely (Southall et al., 2016).

1.1.4 Current Mental Health Support for HE Students

There is no doubt from the studies reviewed above, that for many students their time in HE can be difficult and challenging. Currently, support available to students in HE tends to follow an established and traditional route (Hunt & Eisenberg, 2009; Rückert, 2015; Soet & Sevig, 2006). Student's typically take part in some form of session with professional counsellors (Adams et al., 2017; Goodman, 2017), or mental health first aiders (Brown, 2016). These strategies support students during times of stress, however they are restricted to the extent that they are not continuously supportive, rather they help to solve a problem in one particular moment in time, and sessions can therefore be limiting (Goodman, 2017; Mowbray, et al., 2006). Support can also take the form of developing key skills targeted at mental health needs. This may include skills related to time management, communication and motivation, and encouragement to practice self-care directed towards sleep, exercise, and rest (Tinklin et al., 2005). In addition to supporting key skills, mental health support services within

universities are vital to HE students in the form of providing coping and crisis management skills which are available through counselling and mental health services (Giamos et al., 2017). In the UK, universities support students through various campaigns, one of these being, the Student Mental Health Agreement (SMHA) project. As part of the NUS (National Union for Students) Scotland Think Positive Project, the SMHA initiative works to encourage the collaboration between universities, staff and students focusing on campus based mental health support while recognising the challenges students face (The Open University Scotland, 2020/2021). Alternative treatments may include seeing other professionals including psychiatrists, psychologists, general practitioners, occupational therapists, religious counsellors, or traditional healers such as herbalists (Andrade, et al., 2014). However, the demands of counselling services have grown, not only with the increase in student numbers but with the number of students seeking support for mental health issues (Broglia et al., 2017).

One issue with the current support is that while it is invaluable, it does not always offer long term support, focusing instead on the issue at hand. With 94% of HE institutions reporting an increase for the need of counselling services, combined with reports that less than 29% of universities have an explicit mental health or well-being strategy, and 67% do not provide access to the National Health Service (NHS), mental health services or specialist attention (Thorley, 2017), a bleak picture starts to emerge for HE students suffering from mental health issues. It is unclear why provisions to treat mental health issues in universities are not always in place. Most likely, the majority of the issues involve a lack of resources and funding (Department for Education, 2017; Higher Education Funding Council for England [HEFCE], 2015). However, by not addressing these issues there will be a subsequent societal and economic burden. In a report carried out by the Centre for Mental Health (Parsonage & Saini, 2017), the cost of mental health to employers was reported to be £34.9 billion, and in 2019, the NHS (NHS, 2019) allocated £200 million to local areas that required urgent mental health care. These figures indicate that mental health is prevalent in the current population without even considering the effects of

Covid-19 on HE student mental health (Son et al., 2020). If the new influx of HE students do not receive the support they need this cost will only continue to rise.

Other issues include university policy and staff training, however far more prevalent is the stigma and self-perceived stigma associated with seeking support for mental health issues (DiPlacito-DeRango, 2016). Universities have traditionally been seen as a safe place where the barrier of stigma can be questioned and debated, however DiPlacito-DeRango (2016) also suggests this attitude is not mirrored when the stigma relates to the mental health of staff and students. This in turn has an impact on how staff address or report the need for clear mental health support for these students. There is also the concern of how one may be perceived or judged (by society) as having mental health issues which may prevent individuals from seeking help and support and as a result, worsen their condition (Batchelor et al., 2019).

To summarise, it is clear that there is a significant problem with mental health issues in HE students, ranging from transitional issues such as loneliness and homesickness, and the financial burden and concerns that attending university incurs. It is also clear that while universities and other education stakeholders have an understanding of what the issues are, and are making some effort to address this, further research is required to identify effective interventions for HE students to help improve their well-being, and to ensure this contributes towards a future healthier population. Part two of this chapter will discuss a newer and alternative form of intervention to traditional methods, Canine Assisted Intervention (CAI).

Part 2

1.2 Introduction to Animal Interventions

Humans and animals have had a bond documented as far back to ancient Egypt where the dog-headed Anubis guided souls of the dead and in Ancient Greece, it was believed being licked by a canine had healing abilities including healing the blind (Fine, 2006). Indeed, the use of animals to support human health, both mental and physical, has long been established (Fine, 2006). There is evidence that some Egyptian deities (Bastet, goddess of ancient Egyptian religion) were depicted (and mummified) as cats (Bleiberg et al., 2013; Lacovara, 2017). Similarly, animals are represented in other cultures, for example, Ganesh (a Hindu deity) the remover of obstacles is depicted as an elephant (Dhavalikar, 1991) while bears, whales, cattle, buffalo, goats, and dogs have all been held in awe or with high regard within elements of mythology (Lacovara, 2017; Margul, 1968; Naumann, 1974; Neave, 1988; Wunn, 2000). Florence Nightingale, in her *Notes on Hospitals* first published in 1859, felt small pets were an excellent source of companionship for patients (Nightingale, 1969). In later work, Bossard (as cited in Ascoine, 2005) published a study in 1944 discussing the effects and importance of domestic pets on the mental health of family life, reporting that dogs could provide an outlet for affection and companionship, and Hart (2006), in a discussion on the psychosocial benefits of animal companions, argues that animals enhance quality of life and provide unconditional support. Even Freud was a fan of the use of animals within therapy and would often use his Chow, Jofi in his therapy settings (Walsh, 2009).

The first professionally trained practitioner to formally introduce animals in therapy is thought to be Boris Levinson, who found that when working with children his dog acted as a communication tool and provided a sense of security for the child during the session (Levinson, 1962). However, Levinson's findings were not taken seriously to the point that he was asked if his dog received a share of his fees (Levinson, 1982). Levinson and Mallon (1997) argued that the negativity was a result of clinicians being uncomfortable talking about the role of companion animals within therapy. However

when they surveyed 435 psychotherapists in the New York State, 33% of the 319 responses claimed they had used a pet as a therapeutic aid and 91% found them useful (Levinson & Mallon, 1997).

The use of animals in therapy settings has continued to evolve through the years finding its place in military, medical, educational, paediatric, and geriatric care (e.g., Gadowski et al., 2015; Kawamura et al., 2007; Krause-Parello et al., 2016). A variety of animals have been used in such settings, from domesticated pets (e.g., cats, dogs, guinea pigs and reptiles) to equestrian, sea, and winged animals (Cook et al., 2013; Nathanson et al., 2015; Phillips & McQuarrie, 2010). This literature review will begin by exploring different terms and definitions used to describe animal interventions. It will then move on to discuss the use of canines in school and HE settings to support mental health issues. Finally, issues using canines in these settings will be considered finishing with a summary of the current thesis.

1.2.1 Terms of Use

Animal assisted therapy (AAT) has been defined as “a goal directed intervention in which an animal that meets specific criteria is an integral part of the treatment process” (Kruger & Serpell, 2006, pg. 23). In exploring this kind of intervention, over 20 different definitions were identified and at least 12 different terms; the most frequently used being AAT, animal assisted activity (AAA), animal assisted intervention (AAI), animal therapy and pet therapy. Parish-Plass (2014) argues there is a lack of clarity in definitions used and problematically, there is some blurring of the lines of these terms used to describe animal assisted therapies.

With reference to AAI, AAA and AAT, Phillips and McQuarrie (2010) state that AAI incorporates both AAA and AAT however the aims of these differ. AAT works towards goals in its therapy with the aim of improving human well-being (including psychological, social, emotional, and cognitive function) and to support adolescent mental health (Jones et al., 2019). AAA aims to enhance the quality of life through motivation, education, recreation, and therapeutic benefits (Phillips & McQuarrie, 2010). To further confuse distinctions, Kramer et al. (2009) and Macauley (2006) both use

the term AAT in their studies and while Macauley (2006) specifically discusses participants meeting their 'goals' in line with Phillips and McQuarrie (2010), Kramer and colleagues (2009) discuss results rather than specifically citing goals.

To add to the confusion, AAT, AAI and AAA differ further as AAT has been used in an educational environment in the study of behaviour and reading in the classroom, as opposed to therapy settings (Altschiller, 2010), while AAI is the preferred term of Barker et al. (2015) in their study on pain perception of children in a hospital setting. Additionally, AAA has been used in range of papers to discuss depression (Kruger & Serpell, 2006; Souter & Miller, 2015), social function in children with autism (O'Haire et al., 2014), and in school children with other disability such as learning, emotional or behavioural disorders (Baumgartner & Cho, 2014).

The range of animals used in animal assisted therapies is varied and includes large animals such as equines (Benda et al., 2003) and dolphins (Kreiviniene & Pertula, 2012; Rollins, 2011), midsized animals including canines (Shearer et al., 2016), and smaller animals including reptiles (Murry & Allen, 2012), rabbits (Perelle & Granville, 1993), guinea pigs (Kršková et al., 2010) and birds (Holcomb et al., 1997). While a large majority of this therapy is directed towards mental and emotional well-being (e.g., O'Callaghan & Chandler, 2011; Stefanini et al., 2016; Stern et al., 2013) equine therapy has developed into the field of physical therapy known as hippotherapy; riding a horse to improve balance, posture, and mobility (Park et al., 2014). Furthermore, smaller animals such as rabbits and guinea pigs have been used to improve fine motor skills (Perelle & Granville, 1993), corn snakes have been used by the NHS as therapy for patients with depression (Kakunje et al., 2019) and robotic seals have been used to investigate stress levels in geriatric samples (Wada & Shibata, 2007).

Regardless of the term used there are a number of commonalities between the animal assisted interventions. Firstly, the therapy element always involves an animal and there is always a therapeutic benefit to be had when taking part in animal therapy. Of course, as with any type of therapy, some recipients may benefit more than others. Whether the animal is real or robotic, and while the animal

may enjoy the attention, the session is always a person centred experience with the emphasis placed on the human benefit. Additionally, participants receiving the intervention are often perceived as vulnerable, such as the elderly (Ambrosi et al., 2018), children (Stefanin et al., 2016), those with a disability or conditions, for example cerebral palsy (Elmaci & Cevizci, 2015), depression (Olsen et al., 2016), or anxiety (Perez et al., 2019). Lastly, the therapeutic benefit is either emotional (Crossman et al., 2015), social (Daltry & Mehr, 2015), or a combination of both (Dell et al., 2015).

1.3 Canine Assisted Intervention

One of the most frequently used animals in AAT are canines (e.g., Barker et al., 2016; Binfet et al., 2018; Pendry & Vandagriff, 2019; Wood et al., 2018). As with the different terminologies associated with AAT, interventions specifically with canines have also been defined in a variety of ways. “animal programme” was used by Mercer et al. (2015), with a number of studies using the term “therapy dog” (Barker et al., 2016; Daltry & Mehr, 2015; Fiocco & Hunse, 2017; Hall, 2018; Trammell, 2017). However more specific terms are adopted by Binfet et al. (2018) who use “canine-therapy program”, Delgado et al. (2018) who use “canine play intervention”, and Grajfoner et al. (2017) who use “dog-assisted intervention”.

The key commonality of these studies is that they all use a real canine to facilitate the therapeutic element. Based on the inclusion of a real canine and Phillips and McQuarrie’s (2010) suggestion that AAI incorporates both AAA, and AAT, the term Canine Assisted Intervention (CAI) has been adopted for this thesis. The term CAI has been used by Hartwig and Binfet (2019) in a study to gain a better understanding of CAI programs, and in their book providing guidance for all stakeholders involved in CAI welfare, training, and assessment (Binfet & Hartwig, 2019). CAI was also used by Silas et al. (2019) in a study assessing stress reduction in a campus based canine therapy stress reduction program.

1.3.1 Use of Canine Assisted Intervention in Education

CAI has been effectively used within education ranging from school children (e.g., Gee et al., 2009; Pillow-Price et al., 2014) to those in HE (e.g., Daltry & Mehr, 2015; Quintana et al., 2019). While the purpose of this thesis is to explore the effects of CAI in HE students, much of the published research exploring CAI in educational settings focuses on school children. This is still important as both school and HE students experience anxiety, stress and depression related to educational pressures, and if CAI has a positive impact on school children, it stands to reason CAI would also have a positive impact on HE students. Therefore, the following sections will first briefly consider the use of CAI in children in the classroom, followed by a thorough discussion of the use of CAI for supporting mental health in HE students.

1.3.2 Canine Assisted Intervention in School Children

Canines are a popular form of therapy with children, probably due to the distraction, happiness, fun and tactile nature they offer (Sobo et al., 2006) alongside the emotional benefit experienced (e.g., Friesen, 2010; Lane & Zavanda, 2013). In a school setting, canines are often used to support a range of issues with a particular impact on reading. The use of canines in the classroom has identified improvements in reading skills (Newlin, 2003) alongside better performance and motivation while reading (Schretzmayer et al., 2017). Pillow-Price et al. (2014) found that canines acted as a motivational tool allowing children to better open up to their teachers. Additionally, the children saw the canine as a ‘friend’ and were more comfortable reading out loud to their ‘canine friend’ which had a positive effect on the development of their reading skills. While these studies suggest CAI is a suitable support system for children in schools in improving the learning environment, evidence also exists to support the use of CAI in schools to improve the mental health and well-being of the children (Anderson & Olson, 2006; Esteves & Stokes, 2008; Pinto & Foulkes, 2015).

In a study exploring the effect of canine on children with learning difficulties, Limond et al. (1997) had all participants interact with both a real and a toy canine. The results demonstrated that participants responded better to the real canine compared to the toy canine in terms of looking at the real/toy canine and responding to the adult in the room. However, the handler was also instructed to try to encourage participants to interact with both the real canine and toy canine which may have impacted results. Assuming the handler was instrumental in creating the interaction between canine and participant, it becomes difficult to identify whether the benefits were due to CAI per se, or the interaction with the handler.

In a single-case experimental design, children with developmental disabilities (“mental retardation”, Down’s syndrome and a hearing impairment), were encouraged by their teacher to interact with a canine for eight minutes (Esteves & Stokes, 2008) to explore the social effects the canine had on the children towards their teacher. The study found an increase in behaviour that indicated pleasure or enjoyment by the child and an overall reduction in behaviour indicating a lack of pleasure or enjoyment. The children also seemed to display more positive behaviour at home, with one parent describing how their child was more talkative during the intervention period. The results indicate the canine encouraged the children to communicate in a positive manner with the teacher and the canine. However, results are limited due to it being a single case study with only three participants, and while the authors felt the data collection methods replicated across participants allowed assessment of generalisability, it is a fair to say that a larger sample would give more reliable results.

A positive effect of CAI was also demonstrated by Anderson and Olson’s (2006) who had six school children, described as having severe emotional and behavioural disorders, take part in their everyday classes with a canine present. Student interactions with the canine included one to one sessions and reading to the canine. They found that children interacted more easily with peers and teachers with the canine present, as well as showing an increase in self-esteem and motivation to attend school. It was also demonstrated that the canine helped to de-escalate aggressive behaviour, encourage a sense of self,

and helped the children to better understand their emotional triggers so that they might be more in control of finding solutions to their emotions. However, Anderson and Olson's (2006) study also had a teacher involved with the interaction therefore it becomes difficult to categorically confirm that positive outcomes were a direct result of CAI and not influenced by the canine handler. This study demonstrates that the inclusion of a canine in the classroom is a clear move towards encouraging positive behaviour changes in school. This study is not without its limitations as the teacher had spent up to three years nurturing the relationship between the children and their parents therefore this relationship may have had an impact on the results rather than being a direct result of CAI.

The benefits of CAI in school children also includes psychosocial benefits as demonstrated in a Classroom Canines™ program focusing on reading, social, and emotional skills in the classroom (Sorin et al., 2015). The school identified 11 children as either “at risk” of falling below, or who had already fallen below the benchmark of their year group. Participants were asked to read to the canine which formed the intervention activity. The handler was present during this. In addition, researchers interviewed both the student and the teacher before and after the session and spoke informally to the teachers about the canine program. The results demonstrated that reading scores and attendance improved, as well as social skills. Furthermore, the children felt more motivated to learn, had more confidence in themselves as students, and showed signs of better relationships with their peers. However, the study is limited as only children who the school had identified as having problems were able to access the program, thus results cannot be generalised to all classroom aged children. Sorin et al. (2015) also reported that some of the children became concerned when canines were changed during the overall duration of the program, however there is no indication the sessions stopped or that these participants were excluded from the study.

It has also been suggested that having canines in the classroom can support the development of motor and physical skills (Chandler, 2001). Friedmann et al. (1983) measured children's blood pressure (BP) in response to reading out loud either alone or in the presence of a canine and found BP and heart

rate (HR) levels decreased after interaction with the dog. This study is limited though as it was very casual in design. Data collection was carried out in the recreation room of one of the researcher's homes, and participants were neighbourhood friends of the researcher's children. It could therefore be argued that the setting of the study was too familiar to the children which would have naturally made them more relaxed.

It has also been documented that CAI improves well-being in school children (e.g., Harris & Binfet, 2020; Jalongo et al., 2004; Schuck et al., 2015). A review by Friesen (2010) identifies a wealth of findings including encouraging a positive attitude towards school and providing social support. Tissen et al. (2015) examined the influence of different training methods on social behaviour, empathy and aggression in school children over a three week period. Children received either social training without a canine present, social training with a canine present or interaction with a canine without any particular instructions or training. Results demonstrated that while all three training methods had a positive impact on children's social behaviour, only the group with the canine present experienced a significant reduction in relational aggression (damage or threat to social relationships) which had a lasting effect three weeks later. Therefore, CAI led to children being less likely to exclude others from social activities or gossip and spread rumours in an attempt to negatively affect relationship with others.

In a study that explored the use of social support by a canine to regulate stress in school-aged children, Beetz et al. (2012) allocated male participants to one of three groups. The real dog group were accompanied by a real canine, the toy dog group by a toy canine the size of a real small canine, and the friendly human group (control group) were accompanied by a friendly female student aged between 20-25. In their assigned groups participants took part in stress inducing activities which included presenting a story to strangers and completing maths tasks. The study found that cortisol levels were lower in the real dog group compared to the toy dog and friendly student group. However, no differences were found between groups for self-reported stress levels. It is worth noting the issue of differences in group sizes

with the real dog condition having greater numbers ($n = 24$) than the comparison conditions, the toy dog group ($n = 13$), and the friendly human group ($n = 10$).

Given that CAI has been shown to have a positive impact on school children, both physically and in terms of mental health, it stands to reason it may have the same benefit in an older population who are also enrolled in an educational establishment. The next chapter will explore the use and benefits of CAI in HE to determine if there is a positive impact on mental health related experiences of HE students.

1.4 Canine Assisted Intervention in Higher Education

Chapter 1, Part 1 indicates that mental health issues in HE students is a growing public health concern. The support currently available to HE students and the issues within this support were also discussed. Part 2 continued by introducing the effectiveness of CAI in school children. This chapter will continue by exploring and evaluating the use of CAI in HE students via a systematic review.

The use of canines in a HE setting is a growing area of interest (e.g. Binfet et al., 2019; Butteltmann & Römpke, 2014; Crossman et al., 2015), and much of the research to date focuses on the benefits of the interaction between students and canines on mental health issues such as stress, anxiety and depression (e.g., Butteltmann & Römpke, 2014; Crossman et al., 2015; Dell et al., 2015). In a review that discusses the implementation of therapy dogs in libraries on campus, Jalongo and McDevitt (2015) consider the physiological benefits of interaction with a canine and reduced feelings associated with homesickness and isolation as well as stress and depression. Jalongo and McDevitt (2015) also discuss how dogs have the ability to encourage people to share how they feel whereas they may have not done with another human. In a similar review discussing canines on campus, Charles and Wolkowitz (2019) found having canines in the library encouraged students to take an active role in their education and fostered an attachment to their university. Adams et al. (2017) discuss research using canines to address mental health issues HE students face, and suggest CAI is useful for students who ask for support with

their mental health as they are more receptive to alternative forms of support (such as CAI). Additionally, the authors found therapy with a canine may be more acceptable to students' friends and family than traditional therapy as this may better resemble having a pet. They also suggest that having a canine onsite may act as a catalyst to encourage students to seek help where they previously may not have done so.

Despite the published studies and reviews discussing the benefits of human and canine interaction on student mental health, there does not seem to be empirical research that reviews literature in a *systematic* manner in relation to the benefits of this interaction in HE students. Based on this it was deemed important to carry out a systematic review to critically appraise relevant literature and evaluate the peer reviewed papers that do discuss the benefits of CAI on the mental health of HE students so that a clear interpretation can be made of key elements and the overall outcomes. Therefore, the objective of the following systematic review is to identify, discuss and evaluate existing evidence exploring the benefits of the interaction between human and canine on the mental health of students in HE, in particular anxiety, stress, and depression. It also explores students experience of happiness and satisfaction of life alongside positive psychological functioning, relationships with others and an awareness of self. The results will assist in identifying whether there are gaps in the existing reach and guide the shape of this thesis.

1.5 Systematic Review

1.5.1 Methods

1.5.1.1. Literature search

Literature was searched for and identified in the form of journals from 1950 until 2021. Seven databases were searched on 14th January 2021 to identify relevant papers: British Nursing Database, Cochrane Library, Education Research Complete, MEDLINE, PsycINFO, PubMed and Web of Science. The search term used was:

(“animal therapy” OR “animal assisted activit*” OR “animal interaction” OR “animal visitation” OR “animal support” OR “animal assisted therapy” OR AAT OR “pet therapy” OR “pet assisted activit*” OR “pet interaction” OR “pet visitation” OR “pet support” OR “pet assisted therapy” OR “canine therapy” OR “canine assisted activit*” OR “canine interaction” OR “canine visitation” OR “canine support” OR “canine assisted therapy” OR “dog therapy” OR “dog assisted activit*” OR “dog interaction” OR “dog visitation” OR “dog support” OR “dog assisted therapy”) AND (canine* OR dog) AND (anxiety OR stress OR depression OR mental health OR well-being) AND (school OR student OR college OR university OR campus OR educat*).

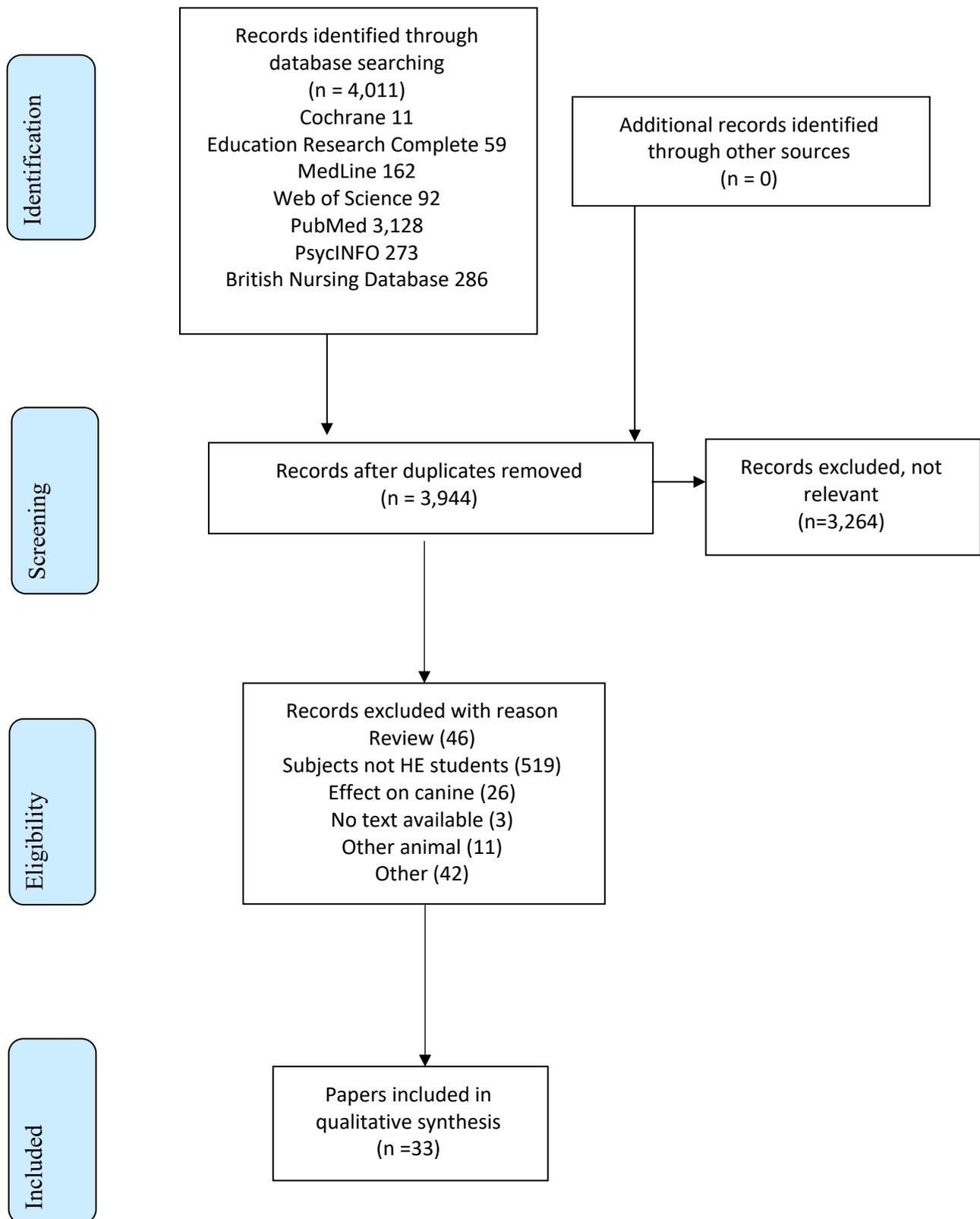
1.5.1.2 Study Selection

The search term resulted in a total of 4,011 papers. Inclusion criteria included: (1) studies published in English, (2) use of real dogs, (3) HE students as participants, (4) addressed mental health, well-being, stress, anxiety, or depression, (5) any sample size, and (6) any intervention involving a real canine (with or without a comparison group). Reviews, studies not published in English, all grey literature and repetitions were excluded. There were no relevant HE student meta-analyses or systematic reviews. As a final but vital exclusion, all studies, meta-analyses or systematic reviews using school children as participants were removed leaving only HE students. This yielded 33 papers in total (see

PRISMA flow diagram, Figure 2). Of these 33 papers, three are multi-study papers (Crump & Derting, 2015; McArthur & Syrnyk, 2018; Trammell, 2017), bringing the total number of studies to 37.

Figure 2

PRISMA Flow Diagram (Adapted from Moher et al., 2009)



1.5.1.3 Data Extraction

Data was extracted from each of the 37 studies to identify key elements (Table 1, Appendix A). These key elements fall into three main categories. Firstly, key characteristics of the study including country of origin, sample population size, age range, participant mental health, socioeconomic status and whether they were rewarded for their participation. Secondly, study methodology including aims, study type, design and setting, interaction type and duration, use of control and/or comparison groups, inclusion/exclusion criteria, number of canines, canine-to-human ratio, perception of canine, effect size, power sample calculation and statistical analysis used. Finally, study outcomes including results and limitations.

1.5.1.4 Assessment of Study Quality

The Quality Assessment Tool for Quantitative Studies from the Effective Public Health Practice Project was applied to assess the quality of studies to identify potential bias or confounding factors (Effective Public Health Practice Project, 2009). Study qualities were evaluated using six categories: selection bias, study design, confounders, blinding, data collection methods and withdrawal and dropouts. For selection bias, 78% of studies were rated as fair (participants somewhat likely to represent the target population) and 22% as poor (participants not likely to represent the target population). 22% of the studies were rated as good in study design (randomised control trial (RCT) or controlled clinical trial), 65% as fair (cohort analytical or case control, cohort design or interrupted time series studies), and 13% as poor (any other, or method not stated). Confounders were rated as good in 78% of studies (controlled for 80% of relevant confounders), fair in 8% (controlled for 60-79% of relevant cofounders), poor in 14% (controlled for 60% or less of relevant confounders, or confounders were not described). Blinding was rated as fair in 8% of studies (intervention status of participants are not made aware to the outcome assessor, or participants are not aware of the research question) and 92% were rated as poor (intervention status of participants is made aware to the outcome assessor, and participants are aware of

the research question). The data collection method was rated as good in 46% of studies (data collection tools are valid and reliable), fair in 11% (data collection tools are valid but not reliable or reliability is not described) and poor in 43% (data collection tools are not valid, or neither validity nor reliability are described). Finally withdrawals/drop outs were rated as good in 16% of studies (follow up rate is 80% or above), fair in 22% of studies (follow up rates are 60-79%), and poor in 62% (follow up rates are 60% or less).

1.5.2 Results

All studies were published in a range of journals, either publishing papers on education, the interaction between animal and human, psychology, health, nursing or veterinarian medicine, and all papers included physical interaction with a canine. Table 1 (Appendix A) presents a summary of the 37 studies.

1.5.2.1 Terminology

A range of terminologies were used to describe CAI. Seven of the 37 studies (18.92%) use AAT and a further 12 (32.43%) use the term Therapy Dog. Three studies (8.11%) used the term Therapy Dog alongside an alternative term: Barker et al. (2016) used Therapy Dog Intervention, Daltry and Mehr (2015) Dog Therapy Outreach Program and Dell et al. (2015) used Dog Therapy Program. Five studies (13.51%) used Animal Assisted Activities (AAA), two (5.41%) Canine Therapy and Wilson (1987, 1991) used the term 'effect of pet'. Two (5.41%) used a variation of 'dog-assisted', Grajfoner et al. (2017) used Dog-Assisted Intervention and Wood et al. (2018) Dog-Assisted Therapy. The remaining six studies (16.22%) used a variation of animal, canine, dog, and pet. Adamle et al. (2009) used the term Pet Therapy, Crossman et al. (2015) Animal Visitation Program, Delgado et al. (2018) Canine Play Intervention, Silas et al. (2019) used Canine Assisted Intervention (CAI), Stewart and Strickland (2013) used Human-Animal Intervention (HAI), and Thelwell (2019) used Dog Interaction.

1.5.2.2. Sample

Sample size ranged from 44 - 1,960 participants (M =183). Of the 37 studies, seven (18.92%) had fewer than 50 participants (M = 41), 24 studies (64.86%) between 51-150 participants (M = 85), and six (16.22%) used over 151 participants (M = 629). Ages ranged from 17-57 with a mean age of 21.17. Fifteen studies (40.54%) did not indicate ages and were therefore excluded from the calculations. Gender balance ranged from 100% to 55% females, 43% to 0% males and 4.7% to 2% other. One study (2.70%) reported a transgender population and in five (13.51%) only female students were recruited. All participants were recruited within the university they were associated with.

1.5.2.3 Canine

Of the 37 studies, Wilson (1987) used the investigators dog and Wilson (1991) used a friendly dog. One study (2.70%) used a companion dog (Stewart et al., 2014) and in Wood et al.'s (2018) study the canines were training to become Guide dogs. Buttelmann & Römpke (2014) did not identify the status of the canine and Thelwell (2019) used a house-trained dog. In the remaining 31 studies (83.78%) all canines were classed as therapy dogs/canines. Handlers or canine owners were present during all data collection. Twenty three studies (62.16%) gave specific canine breed and canine ages ranged from 10 months to 11 years, the remaining 14 (37.84%) did not include this information. Breeds included Collies, Golden Retrievers, Greyhounds, a Rhodesian Ridgeback and Labradors alongside mixed breeds. Twelve studies (32.43%) used one canine in their research, one study (2.70%) used two canines, and another (2.70%) used three. One study (2.70%) had five canines, 18 studies (48.65%) used five or more canines and in four studies (10.81%) the number of canines was unclear

1.5.2.4 Study design

Within the 37 studies, there were five different study designs. Fifteen studies (40.54%) employed an intervention only design with no control or comparison group, and 13 studies (35.14%) had a control group alongside an intervention group. Two studies (5.41%) had a comparison group alongside an intervention group but no control group and six of the studies (16.22%) used a comparison design examining an intervention group against a comparison and control group. The last study, ((2.70%) Shearer et al., 2016) was a two phase study. Phase one had an intervention alongside a comparison group and phase two used a comparison, an intervention, and a control group.

Using an intervention only design, Dell et al. (2015) had other well-being activities available at the same time including hand and body massages and snacks however these were not all available on all campuses that took part in the study. Two studies (5.41%) had a canine or a human in the room while participants watched a traumatic film and one (2.70%) asked participants in the experimental group to interact with a real canine while the comparison group viewed images of the same dog. In the two studies (2.70%) that had a comparison group but no control group, one asked the comparison group to read (Muckle & Lasikiewicz, 2017), and another had participants complete number and word tasks either with or without the canine present (Stewart & Strickland, 2013). Additionally, of the three papers that use a multi-study design, a combination of designs was adopted. Crump and Derting's (2015) first study consisted of both an experimental and control group and study two only used a canine group. Both of McArther and Syrnyk's studies (2018) used only a canine group, and in Trammell's (2017) three studies, study one had an experimental group and studies two and three had both experimental and control groups. Hall (2018) identified long term effects (16 weeks) as part of their discussion, while Binfet (2017) and Shearer et al. (2016) carried out follow up data collection sessions 2 weeks post-intervention, and Dell et al. (2015) and Ward-Griffin, et al. (2018) 3 months and 10 hours respectively.

1.5.2.5 Study Location

Of the 37 studies, 29 (78.38%) were carried out in a private room and five (13.51%) in a common area on campus where students could come and go. In two of the studies (5.41%) the location was unclear and one (2.70%) described the location as being in an *appropriate area*.

1.5.2.6 Measures and instruments

Thirty one studies (83.78%) used quantitative measures, one (2.70%) qualitative measures and five (13.51%) adopted mixed methods. A total of 30 standardised measures were used (see Table 2 for full details). Of the 37 studies, 33 (89.19%) applied both pre and post measures. A further three (8.10% Adamle et al., 2009; Daltry & Mehr, 2015; Dell et al., 2015) only used post measures, and one (2.7%, McArther & Syrnyk, 2018) uses post measures in their first study, and both pre and post measures in their second.

Table 2*Full List of Standardised Measures Used Including Measure and the Number of Items per Measure.*

Variable	Measure	Items per Measure
Anxiety	Audience Anxiousness Scale	12
Anxiety	Burns Anxiety Inventory	32
Anxiety	State Trait Anxiety Inventory	20
Anxiety and depression	Hospital Anxiety and Depression Scale	14
Assesses attitudes	Semantic Differential	3 (dimensions)
Attitude towards animals	Animal Attitude Scale	20
Attitudes towards pets	Pet Attitude Inventory	18
Credibility and expectancy	Credibility/Expectant Questionnaire	6
Connectedness to campus	Connectedness to Campus	1
Current mood, stress, and arousal	Affect Measure	3
Depression	Becks Depression Inventory	21
Experiences with a canine	Experiences with Dog Inventory	13
Functional social support in chronically ill persons	Medical Outcomes Study Social Support Survey	8
Happiness	Subjective Happiness Scale	4
Homesickness	Homesickness Questionnaire	33
Homesickness	McAndrew's Measure of Rootedness	10
Human animal bonding	Pet Attitude Scale	18
Life satisfaction of subjective well-being	Satisfaction with Life Scale	5
Loneliness	University Of Philippines Loneliness Scale	25
Measures effective therapeutic relationships	Session Rating Scale	4
Mindfulness	Five Fact Mindfulness Questionnaire	39
Mood	Brief Mood Introspective Scale	16
Mood	Mood Tracking Scale	10
Mood	UWIST Mood Adjective Check List	24
Positive and negative affect	Positive and Negative Affect Schedule	10
Self esteem	Self-State Esteem Scale	20
Sense of belonging	Sense of Belonging in School	14
Stress	Stress Arousal Checklist	2 (subscales)
Stress	Perceived Stress Scale	10
Well-being	Warwick-Edinburgh Mental Well-Being Scale	14

1.5.2.7 Intervention duration

The duration of CAI ranged in all 37 studies from 2 minutes to 2.5 hours, with one study (2.70%) having an intervention duration of 5 minutes, three studies (8.11%) having a 10 minute duration, one study (2.70%) an 11 minute duration and another (2.70%) a 13.5 minute duration. Eight studies (21.62%) used a 15 minute duration and four (10.81%) a 20 minute duration. A further 14 studies (37.84%) had an intervention duration of 30 minutes or more. Four studies (10.81%) recorded a range of interaction durations, Hall (2018) allowed a duration of 2-30 minutes, Dell et al.'s (2015) from 5-60 minutes, Stewart et al. (2014) from 5 minutes to 2 hours and Crossman et al. (2015) between 7-10 minutes. The final study (2.70%), Trammell (2019) did not specify interaction duration.

Twenty seven of the studies (72.97%) had the intervention at only one time point, while 10 (27.03%) had multiple interventions. Sessions were spaced out over a two week to three month period with a minimum of two sessions (McArthur & Syrnyk, 2018; Trammell, 2019) and maximum of 16 sessions (Hall, 2018) available to participants.

1.5.2.8 Intervention activity

Of the 37 studies, 13 (35.14%) had participants take part individually. Buttelman and Röpke (2014) assigned participants to a canine, fish, plant or no interaction control group, Crossman et al. (2015) asked participants to play with a canine, view images of the canine or be part of the control group by simply waiting, and Lass-Hennemann et al. (2014) assigned participants to one of four groups. All four groups watched a traumatic film however, the real dog group sat with a real dog, the toy dog group sat with a life sized toy Collie and the friendly human group was accompanied by a previously unknown female graduate student. The alone group watched the film on their own. In their later study Lass-Hennemann et al. (2018) had all participants watch a traumatic film. Following this the dog group interacted with a canine for 15 minutes, the dog-film group watched a film clip of someone interacting with a dog for 15 minutes and the alone group relaxed for 15 minutes. Stewart and Strickland (2013)

allocated specific tasks to participants in the presence of a canine which included Monk and Conrad's clerical tasks (basic maths and proof reading) and Wilson (1987, 1991) had participants read quietly or out loud with a canine present. Grajfoner et al. (2017) had the intervention group interact with both the canine and handler and the control group interact with the handler only. Thelwell (2019) had the intervention group interact with a canine and the control group watched a video of a dog, and Machová et al. (2020) had a canine intervention group, a relaxation comparison group who used anti-stress cubes, colouring books and a phone with music, and a no activity control group. Delgado et al. (2018), Fiocco & Hunse (2017) and Ward-Griffin et al. (2018) asked participants to simply interact and play with a canine. Five of the studies (13.51%) chose to have participants interact with the canine in groups in a busy area on campus where students could choose the level of interaction. A further 19 (51.35%) had participants interact with the canine in groups in a private room. None of the studies reported following any pre-published report, manual or procedure.

1.5.3 Discussion

The aim of the systematic review was to assess and evaluate existing research on the benefits of CAI on anxiety, stress, depression, and feelings of well-being in HE students. The search identified 33 papers from 20 peer reviewed journals totalling 37 studies. Thirty (81.08%) of the 37 studies reviewed found CAI effectively reduced a range of negative emotions. Both male and female participants took part with ages ranging from 17–57. The systematic review demonstrated that study design, intervention activities, intervention duration, and measurements of mental health used were diverse in approach and application. As a result of this, and the blend of comparisons of different treatments with different comparators, the many outcomes have been summarised under two main outcomes in relation to the benefits of CAI for HE students: (1) mental health benefits, and (2) social benefits. In addition, the systematic review will review the literature identified in more detail and identify a number of methodological limitations within the studies.

1.5.3.1 Outcome One: Mental Health Benefits

Effects of CAI on Anxiety. Of the 16 studies (43.24%) that measured anxiety, 12 identified that CAI effectively reduced anxiety (see Table 1 for a summary of details). Five of these studies applied a stressor to elicit higher levels of anxiety before then looking at whether anxiety was reduced following the interaction. Eleven studies (29.73%) measured existing anxiety without applying a stressor, and four of the studies (10.81%) did not report entirely supportive results. Physiological measures as an indicator of anxiety were used in seven studies (18.92%), however only four (10.81%) recorded a decrease in BP as a result of CAI (Jarolmen & Patel, 2018; Muckle & Lasikiewicz, 2017; Wood et al., 2018; Wilson, 1987). Lass-Hennemann et al. (2014, 2018) found physiological and endocrine stress markers increased as a result of their applied stressor but these were not moderated by the canine intervention. Butteltmann & Röpke (2014) removed all physiological measures (BP and HR) as over 50% of participants did not indicate a positive effect in relation to anxiety, and it was felt BP and HR were influenced by other physical factors such as speech and movement.

In Butteltmann and Röpke's (2014) study which explored the effects of CAI on four different intervention groups, anxiety was induced in HE undergraduate students by asking them to create a presentation on a subject they had little knowledge of. Following this the canine group were asked to pet a canine, the fish group were asked to try to make a fish accustomed to a human, the plant group were asked to apply water to the leaves of a plant with a brush, and the control group were asked to wait for further instructions. While all experimental groups experienced a reduction in anxiety following the intervention (canine (↓ 56.2%), fish (↓ 58.2%) and plant (↓ 45.6%), those in the fish group had a greater decrease in anxiety compared to the CAI. However it was also concluded that only the canine group experienced post intervention levels of anxiety that were lower than the induced anxiety levels and that the CAI group laughed more during interaction indicating a sign of enjoyment. However, it could be argued that the groups are not truly comparable in that a fish is unlikely to respond to a human in the same way a canine would, and of course the plant does not respond at all. Thus the external validity of

the stimuli used may be questionable. One further limitation is that of the handler. While the authors report the handler did not interact with participants, they do not explain if the handler was present or absent during the CAI session. Having the handlers present during CAI to monitor the canine seems to be the usual procedure in canine therapy (Barker et al., 2016, Binfet & Passmore, 2016; Dell et al., 2015; Hall, 2018) therefore it could be inferred the handler would have been present to monitor the canine. It is possible that participants were not fully comfortable expressing themselves during CAI due to having another human in the room. The assumption here is that the fish group did not require someone to monitor the fish therefore participants could have been more at ease with only themselves and the fish in the room during data collection. It is also possible that those in the canine group experienced fear or discomfort due to the size of the dog (a Border Collie) in comparison to the fish. Additionally, the fish may have been seen as a safer option as participants interacted with the fish within a built in barrier (the fish tank) which offers participants protection whereas the canine group did not have this. Both these issues could have caused participants to be less comfortable in the canine group in comparison to the fish group and effected the results.

In Lass-Hennemann et al.'s (2014) study, an externally valid stimulus was used in the comparison groups and the all-female HE student participants watched a traumatic film clip accompanied by either a trained therapy dog, a life size collier toy dog, a friendly female or they watched on their own (control group). The study demonstrated that the group who were accompanied by a therapy dog had a greater reduction in anxiety levels compared to those accompanied by the soft toy dog or those who watched the film clip on their own. However, CAI was not the most effective intervention as results from participants who were accompanied by a canine were comparable to those who were accompanied by a friendly human. One issue with the findings of the study is that while those who participated with a canine found their anxiety levels were reduced lower than the toy dog and alone group, the canine results were comparable to those who took part in the friendly person group. This may be due to the results of the Pet Attitude Scale (PAS) which demonstrated that scores were higher

in the friendly person group than the dog group. Reporting that higher PAS scores relate to a better attitude towards pets (Morovait et al., 2008), it could be suggested that inconsistent baseline PAS scores had an impact on the results of CAI and, in order to accurately measure and compare the effect of CAI in these two groups, participants should record similar PAS scores before taking part.

Wilson (1987) used three test conditions to measure cardiovascular responses (BP and HR) after interacting with a canine. All participants were required to sit quietly for a baseline period before taking part in all three conditions in the following order: reading aloud, reading quietly and finally petting a friendly dog. She found a physiological effect by lowering BP and a psychological effect by lowering stress levels. However, CAI was no more effective than a comparison exercise as it was also demonstrated that reading quietly had a similar effect in reducing anxiety levels. One limitation of this study related to the age range of participants as the canine may have had a novelty effect on younger respondents and had an impact on the increase in BP. Following this, Wilson's (1991) study followed the same design as her 1987 study but explored the psychological consequences of stress. While Wilson (1991) found interacting with a canine had a positive psychological effect by lowering anxiety response levels, she also found interacting with a canine had a reduction in anxiety similar to that of reading quietly.

Crossman et al. (2015) also explored the effect of CAI on reducing anxiety in HE students. The experimental group played with a real dog, the no-interaction control group viewed images of the same dog, and a no-treatment control group were assigned to a waiting area. Participants were given seven minutes to interact with the canine with an optional three additional minutes. Crossman et al. (2015) identified a greater reduction in anxiety in the experimental group in comparison to the no-interaction control group. Interestingly, they also found that participants who viewed images of a dog also experienced a greater reduction in anxiety in comparison to the no-interaction control group. This reduction was not as substantial as the reduction experienced in the experimental group, nonetheless it is an important indicator of the ability canines may have in reducing anxiety. A major flaw of this study

is that participants were offered an additional 3 minutes. It is feasible that there may be a greater effect in a 10 minute intervention duration in comparison to a seven minute duration, however the authors provide no indication of how many participants used this additional time. The study also only used one canine which could limit the impact of results when generalising this to other canines or certain types of canines.

Other studies have investigated long term effects of CAI on anxiety and depression. In Hall's (2018) study, participants were allocated to either the treatment group who interacted with a canine (either petting or talking) over a 16 week period, or the control group. Participants in the control group did not interact with a canine, instead they were simply required to complete post measures after the 16 week program. Hall (2018) found a greater reduction in anxiety in the treatment group in comparison to the participants who did not interact with the dog. However, baseline depression scores were significantly different across the group therefore the effect of CAI on depression was not analysed. The main criticism of this study relates to the canine interaction as the experimental group were allowed to interact with the canine for as long as they chose, and the interaction level and activity was left for the participant to decide meaning this may have influenced the reduction in anxiety reported by individual respondents. More concerning is that Hall (2018) reports that not all participants in the control group abstained from interacting with the canine. This may be due to the canine being on campus across a number of locations over a 16 week period and the author having no control over participant interactions with the canine outside of the study. Additionally, no attempt has been made to clarify how many in the control group interacted with the canine, for how long, or the level of interaction. More crucially, these participants should have been removed from the analysis.

In a more informal study design, Stewart et al. (2014) collected their data in a common area in a popular residential hall to assess whether their CAI session was effective in reducing anxiety and loneliness. In groups of 10-15, participants interacted with a canine and were allowed to pet, hug, or brush the canine. Following the interaction there was a significant reduction in self-reported anxiety

levels. However, as participants took part in groups, the social element of the intervention may also have had an effect on loneliness as participants were encouraged to interact with each other. Finally, Stewart and Strickland (2013) who had participants carry out clerical tasks either in the presence of a canine, or as part of the absent animal control group found that the presence of a canine was not enough to reduce anxiety in all participants. In addition, some participants were found to have high anxiety scores however the study suggests these high anxiety levels may be due to these participants being unable to interact with the canine due to the difficulty of the clerical tasks they were set.

Sixteen studies in this systematic review explored the benefits of CAI on anxiety levels in HE students with 12 identifying that in some capacity, interaction with a canine reduced participants levels of anxiety. The results are particularly compelling as studies varied substantially in how anxiety was measured (see Table 1). Another variation in study design were the number of canines used across studies which makes comparing studies difficult. While most studies recorded how many canines were used (Lass-Hennemann, 2014, 2018; Thelwell, 2019; Wood et al., 2018), others (e.g., Dell et al., 2015) did not record canine numbers, or for how long participant interaction lasted.

While the majority of studies did indeed find a positive effect of CAI on anxiety levels, it is important to note some also demonstrated reductions in anxiety in non-canine comparison or control groups which indicates that CAI was less effective than other interventions. Lass-Hennemann et al.'s study (2014) found that while those in the canine group experienced a greater reduction in anxiety post intervention in comparison to the alone group, results from the canine and friendly human group did not differ. Similar results were found when assessing negative mood. This being that lower anxiety levels were not observed in participants who interacted with the canine when compared to results from those who took part in the friendly human group. Additionally, when measuring cortisol, Lass-Hennemann et al. (2014) found no differences between the four groups in physiological stress responses demonstrating that being accompanied by a canine was no more effective than the other experimental conditions in moderating physiological stress. Similarly, Spruin et al. (2021) on using a canine group,

a mindfulness therapy comparison group and a control group found the mindfulness group to be as effective as the canine group in reducing student anxiety levels.

Buttelmann and Röpke's (2014) study differed. While they found those in the canine group did experience a reduction in anxiety, this was not comparable to the fish intervention group. Indeed those in the fish group experience a greater reduction in anxiety (↓ 58.2%) when compared to the canine group (↓56.2%). Shearer et al. (2016) also found CAI to be less effective than the comparison intervention group. While the canine group recorded a greater reduction in anxiety in comparison to a no-intervention control group, the comparison group receiving a mindfulness intervention, with activities including breathing and basic yoga, demonstrated significantly lower state anxiety than the canine group. Therefore, in comparison to other interventions, CAI may not always be the most effective intervention to address anxiety levels.

The results of these studies begin to provide some evidence to support the use of CAI to reduce anxiety levels in HE students. However the studies vary in design, methodology, location, duration and measures, and at times the lack of rigorous design and inappropriate control groups make it difficult to determine whether the effects reported were a direct result of CAI per se.

Effects of CAI on Stress. In light of the issues that may increase stress levels in HE students (see Part 1), it is important to determine whether CAI can be used as a suitable support system to manage this stress.

Twenty two (59.46%) of the studies in the systematic review explored the effect of CAI on stress, with 17 identifying a reduction in stress following CAI (see Table 1). Of these 22 studies, six (16.21%) used a physiological measure (HR, BP, saliva nerve growth factor, (sNGF), heart rate variability (HRV)).

Crump and Derting (2015) carried out two studies exploring the impact of CAI on HE student stress. The first study used a within subject design with all participants taking part in both a canine and

non-canine condition. Baseline measures were first carried out followed by participants being allocated to one of the two treatment conditions in time period one (e.g., with a canine, without a canine). Participants then moved onto the other treatment group (e.g., without a canine if they had a canine in the first time period and vice versa). As there was no significant effect of the order of treatment group, all results were analysed together. Findings demonstrated a reduction in stress levels as a result of CAI. Study two used a between subject design in which participants were allocated to either a canine group where participants interacted with a canine, or a no canine control group in which participants took part in non-stressful tasks such as colouring in. Results of the second study demonstrated that both groups experienced a reduction in stress. The reduction in stress in the canine interaction group was 63% greater than the control group, however there no significant difference demonstrated between groups in relation to the perceived stress scale (PSS) scores. Both studies also measured HR and BP and found no significant impact of stress levels thus it could be suggested that psychological markers are not suitable for measuring stress in response to CAI. Both studies are limited by having a handler present as this may create a different dynamic between canine and participant and participants may not fully relax and interact as they might do without another human present. Having the handler/owner in the room may also encourage the canine to behave differently with the participant even if the handler/owner does not actively participate in the interaction activity. The added element of the handler present during CAI makes it difficult to identify whether the results were a direct response to the canine or a combination of both canine and handler.

Further stress relief in HE students as a result of CAI was demonstrated by Fiocco and Hunse (2017) who had participants either interact with a therapy dog (experimental group) or sit for the intervention duration (no-dog control group). They found no significant effect of group on changes in positive affect (the change in affect post stimulus or positive emotions) despite the control group having the tendency to record lower levels of positive affect in comparison to the therapy dog group. Additionally, the therapy dog group reported significantly less of an increase in electrodermal activity

used to measure stress in comparison to the control group demonstrating a more effective response in buffering against stress in those who interacted with a canine. One issue with this study is the use of electrodermal readings as external influences such as humidity may affect readings (Ferguson et al., 2019), however the authors do state that a trained researcher carried out this reading. Having said that, trained may not mean skilled or experienced.

Physiological markers have also been used to measure stress reduction relating to CAI (Delgado et al., 2018; Wood et al., 2018). In Delgado et al.'s (2018) study, participants' cortisol levels and vital signs (BP and HR) were measured before and after interacting with a canine. As the only study to find any significant effect using physiological markers, the authors demonstrated a reduction in salivary cortisol levels and BP indicating an effect of CAI in reducing stress levels. However, the study did not have a control group with which to compare findings. Furthermore, during data collection, participants interacted with one canine but there were two canines working in the room. When one canine was not busy participants were able to interact with both dogs however there is no record of how many students interacted with one or two canines, therefore it is not possible to determine if the number of canines had an impact on CAI.

BP was also measured by Wood et al. (2018) in a self-selecting sample to measure stress levels in HE students. The authors found that interacting with a canine in small groups produced a significant reduction in BP. Although Wood et al.'s (2018) study uses physical markers to determine a benefit of CAI, results are limited by the lack of a control group. Additionally, that participation took part in groups makes it difficult to decipher whether the benefit of CAI was as a direct result of the canine or the social interaction of being part of a group.

Barker et al. (2016) and Griscti and Camilleri (2020) both used physical markers but did not find an effect of CAI. In Barker et al.'s (2016) RCT study saliva nerve growth factor and saliva alpha amylase were used to measure physiological stress. The results found that either the levels required were not detectable, or that there were no significant changes in these levels indicating that CAI has no

physiological impact on stress levels. Griscti and Camilleri (2020) used a HR wrist monitor to measure participants HR with or without the canine present during a 2.5 hour class. While the HR pattern mirrored what the researchers expected to see when taking part in a cognitive task, there was no significant difference between the canine being present or not. These results demonstrate that there was no impact on stress levels when a canine was present.

One final study that found there was no effect of canine was Stewart and Strickland (2013) who had all participants carry out basic clerical tasks such as proof reading or maths. They found that while the presence of a canine may provide relief from stress for those who had a positive attitude toward companion animals providing they had what the authors labelled average-stress jobs, this was not the case for those who had high stress jobs, and it was concluded that the presence of a canine did not reduce stress in these participants.

Stress was consistently found to be significantly reduced following CAI with 16 studies that looked at stress indicating stress relief post CAI intervention. From the largest to the smallest, the studies varied in study design including the group size in which participants experienced CAI (see Table 1), whether participants took part individually (Delgado et al., 2018; Fiocco & Hunse, 2017) or in larger groups (Adamle et al., 2009; Binfet et al., 2018; Daltry & Mehr, 2015). Additionally, the number of canines differed, for instance, Delgado et al. (2018) allocated one canine per participant, however there were two dogs working in the data collection area. If one was not busy participants were allowed to interact with both dogs, however this frequency was not recorded adding another issue when comparing studies. Importantly, similar to the anxiety based studies, across a range of CAI designs, stress levels were reduced in 17 studies. One difficulty with drawing conclusions from these studies is the lack of control groups. While some (e.g., Barker et al., 2016; Griscti & Camilleri, 2020; Ward-Griffin et al., 2018) demonstrated reductions in stress in a canine group in comparison to a control group, many others (e.g., Binfet et al., 2018; Dell et al., 2015; McArthur & Szyrnk, 2018; Wilson, 1987, 1991; Wood et al., 2018) did not compare CAI to a control group.

The impact of these studies follows those of anxiety in that they begin to demonstrate an effect of CAI on the mental health of HE students. However, the research continues to be limited in terms of study design, and inadequate control groups. Studies are also limited due to the use of group interventions or having a handler present, making it difficult to determine whether the effect of the canine is directly responsible for reductions in stress. It is clear further research is required to better understand whether CAI might be an effective intervention in supporting stress levels in HE students.

Effects of CAI on Depression. As research exists suggesting there is an association between stress and depression (e.g., Egilmez et al., 2017), it is possible that CAI may also have a positive impact on HE students experiences of depression. However, when researching the use of CAI as an intervention for depression, there was found to be a lack of empirical research crediting CAI as an effective therapy tool. Depression was measured by two (5.41%) of the 37 studies in the systematic review.

In Shearer et al's. (2016) study exploring the effects of CAI on depression including heart rate variability (HRV) in HE students, Shearer and colleagues compared a canine group (who were asked to interact with a therapy dog for an hour, once a week for four weeks) and a mindfulness group (who took part in mindfulness training such as breathing exercises and basic yoga once a week for a total of four weeks). A no treatment control group were asked to complete the same questionnaires as the other two groups but complete these online. The authors demonstrated that the mindfulness group reported less anxiety in comparison to the therapy dog group after the third and fourth sessions, and that both the therapy dog group and mindfulness group were less dysphoric than the control group. However, no significant difference was found in dysphoric levels between the therapy dog group and mindfulness group, alongside no significant difference between the canine interaction group and mindfulness group relating to depression. The authors also lost some of their HRV data limiting the overall reported results. Follow up measures were carried out approximately 1-3 weeks after the final measures were taken, however they did not track stressors participants may have experienced during this time.

Hall, (2018) also measured the impact of interacting with a canine over a 16 week period and concluded there was no qualifiable impact of CAI on depression. However, baseline depression measures were found to have an *abnormal distribution* therefore the depression results were not analysed. Two further studies (5.41%, Dell et al., 2015; Stewart et al., 2014) made reference to depression and identified a benefit of CAI on participants feelings of loneliness. The commonality between these studies was group rather than individual participation, therefore, not only did the participants benefit from the therapeutic value of CAI, but also the positive influence of social interaction with other humans. It could be that CAI is simply not a suitable intervention for alleviating symptoms of depression in HE students, or it may be that as depression is often a long-term issue occurring throughout one's life, rather than a state issue. Thus it may be harder to address depression with a one off brief intervention. However, it is possible that long term CAI, used in a similar fashion to that of CAI in military personnel suffering with PTSD (Stern et al., 2013) may be beneficial to those suffering with depression. Alternatively, it may be that depression consists of a set of symptoms that last days, weeks or months, and may be harder to treat than with a short one off intervention. The reason may be far simpler, this being that not enough studies have explored the relationship between CAI and depression. Taken together, there is a lack of empirical research exploring the impact of CAI on depression in HE students, and it is clear that this is an area that requires further research.

1.5.3.2 Outcome Two: Social benefits

The second main outcome of the systematic review was the evidence of social benefits as a result of CAI. Given that the transition to university can be a difficult experience (Ang & Liamputtong, 2008; Binfet & Passmore, 2016), the use of CAI as a social tool and to support loneliness may improve well-being in HE students (Binfet & Passmore, 2016). Studies such as Shearer et al. (2016), identified the social element of CAI as being a strong contributing factor to reductions in anxiety levels, although ultimately the canine interaction was the key factor. It was also demonstrated that the social

environment of CAI aided students in forming friendships that otherwise would not have been made by encouraging a less formal social environment (Binfet & Passmore, 2016). CAI may therefore be particularly suitable for students who are experiencing homesickness (Thurber & Walton, 2012) or loneliness (Dell et al., 2015).

Six studies (16.22%) found social factors had a positive influence on the benefit of CAI. In Adamle et al.'s (2009) study a group CAI setting was used. Participants sat together through a presentation with therapy dogs present. They were then able to physically interact with the canines. The findings demonstrated that while only 41% of participants had heard of the term 'pet therapy' as used by the researchers, 96% of first year students expressed an interest in pet therapy being available on campus. The authors concluded that a pet therapy program may be accepted by university students and that it may provide beneficial support. Additionally, taking part in CAI could be used to help students establish new social relationships. However as the questionnaire used was created for the purpose of gathering feedback from the session, caution should be taken when interpreting results. Respondents chose to take part in the study and were fully aware that there would be canines present. Therefore, they may have had more personal interest in canines and may not accurately represent the general student body.

Dell et al. (2015) carried out a collaborative study incorporating data from three Canadian universities. Participants took part in CAI either individually or in groups and were allowed to interact with the canines for up to an hour. How many students took part individually or in a group, as well as group numbers, was not recorded. The authors reported a positive social effect of CAI as participants reported it gave them the opportunity to meet new people however as this only represented .07% of participants (n=3) it is at best, a minor finding. Additionally, participants felt that the canines helped with feelings of loneliness. Potentially problematically, participants were able to interact with a canine for up to 60 minutes and the authors estimated 15% returned on the second day to interact with the canines again. The duration and frequency of interactions were not recorded therefore it becomes

difficult to understand whether this support with feelings of loneliness was because of the number of visits, or the length of each visit. Additionally, data collection conditions in all three universities were not identical. One university carried out both individual and group sessions over a three day period and offered hand massages, snacks and free gifts as well as study and stress reliever tips. At the second university only individual sessions were offered over six days, and the final university offered individual sessions over two days. Participant numbers from the individual universities that took part are not given thus the irregularities between the first university and the two who only offered individual CAI sessions add to the limitations of this study as there is lack of consistency from all three universities in regard to data collection group numbers. The lack of detail relating to how many students took part in the hand massages, food and free gifts also makes it difficult to isolate whether they contributed towards the self-reported positive results of the CAI sessions or whether the results were purely related to the impact of CAI.

The issue of homesickness has also been found to have a negative impact on retention and academic achievement (Sun et al., 2016) and leads to high levels of loneliness (Patil et al., 2016). Homesickness was therefore a central feature of Binfet and Passmore's (2016) study, who assessed the effect of group CAI in students in a campus setting. Participants either interacted with a canine in small groups of three or four, or were placed into the control group and asked to carry on as normal with no canine interaction. The study was carried out over an eight week period and demonstrated that canines helped to facilitate social interactions as the environment allowed them to chat and make friendships that otherwise would not have been formed. Binfet and Passmore (2016) also found a reduction in homesickness, a greater increase in satisfaction with life and connectedness to campus. However, it is worth noting that participants were not randomly allocated to a group.

In a later study, Binfet (2017) used a RCT to allocate participants to one of two groups. Similar to Binfet and Passmore (2016), the treatment group interacted in small groups of three to four with a canine and the canine handler who shared information about the dog and practiced empathetic listening.

The control group took on a business-as-usual model and studied information from their own course. The study found that the treatment group experienced a significant reduction in homesickness and stress, and a significant improvement in a sense of belonging. The study is limited by the presence and influence of a handler and the mainly female sample (78% female). However, more importantly Binfet (2017) only uses the PSS which is better suited to measure stress over a longer period of time therefore a measure such as a visual analogue scale (VAS) that measures one moment in time may have been more suitable.

The finding that there is a social benefit of CAI is important as it indicates CAI could be used to support HE students struggling to meet new people, in facilitating social interactions and in building new relationships. However it is important for future research to focus upon the social environment only, rather than also including additional external influences (e.g. a busy area on campus or food and hand massages) in order to determine whether there is an ideal number of participants in a group setting that increases the efficacy of CAI.

1.5.4 Issues with CAI Research

The above discussion presents a range of studies that have found CAI has a positive impact on anxiety, stress and depression using various study designs. However, they are not without flaws including issues with the measures used, not controlling for baseline differences, external factors, or differences in interaction duration. General methodological limitations of CAI will be explored further below as well as the effect of the handler. These methodological limitations, coupled with unsupportive evidence demonstrates a greater need for research to establish whether CAI is an effective intervention in supporting the mental health of HE students.

1.5.4.1 Methodological Limitations

Lack of Control Groups. One issue with many of the studies discussed thus far is the lack of a control group receiving no treatment (e.g., Delgado et al., 2018; Dell et al., 2015; McArthur & Surnuk, 2018; Stewart et al., 2014; Wood et al., 2018). This issue, echoed by Brelsford et al. (2017) in a systematic review on AAT interventions in the classroom, does not allow for a comparison to be made between an experimental group and a control group. The lack of a control group lessens the results of the study. Studies that use both an experimental and control groups are stronger in study design and have more reliable results (Fiocco & Hunse, 2017; Hall, 2018; Jarolmen & Patel, 2018; Ward-Griffin, et al., 2018). Applying a control group allows for a comparison of a variable to be made against a benchmark (Fiocco & Hunse, 2017, therapy dog group verses no-dog control group). The control group also allows the elimination of variables, or to examine the efficacy of certain variable (e.g., Buttelman & Röpke, 2014, fish, canine, plant).

Lack of Randomised Control Trial Design. The lack of RCT's in studies looking at the effectiveness of CAI in HE students is also problematic. RCTs are rigorous in creating an unbiased study and exploring cause and effect between treatment and results. By randomly allocating participants to experimental or control groups, participant characteristics are balanced out (Hariton & Locascio, 2018). As such, random allocation helps to prevent systematic differences that may exist between groups from influencing the results. A minority of studies looking at CAI in HE students do use an RCT design (Barker et al., 2016; Binfet, 2017), and others seem to follow an RCT design, although do not specify that their studies are RCTs (Fiocco & Hunse, 2017; Hall, 2018; Lass-Hennemann et al., 2014; Ward-Griffin, 2018). Using an RCT does not seem to be standard practice in CAI research.

While there seems to be a lack of RCT's in CAI research, it may be that while some found a positive effect of CAI, they were not designed with a scientific approach to effectively explore and evaluate the impact of CAI. This gives the appearance of a considerable quantity of research exploring

the benefits of CAI but on further exploration, there seems to be an absence of quality in the study designs.

Intervention Duration. An additional problem is that many studies do not record intervention duration, or no restriction is placed on duration of frequency of CAI (e.g., Dell et al., 2015; Trammell, 2017). In Silas et al.'s (2019) study, the authors record that participants have a maximum of 90 minutes to interact with the canine and that the average length of time spent with a canine was 29 minutes. While there is a record of these durations, there is no record of participants individual durations or discussion regarding the relationship between duration and stress reduction. In light of the finding that one participant may have interacted with a canine for 5 minutes and another for 90, it becomes difficult to understand whether duration has an effect on the impact of CAI. This issue is also found with Trammell (2017) who allowed participants a maximum of two hours, and Dell et al.'s (2015) study who recorded that participants interacted with a canine for "a few minutes" (pg. 314) or up to 60 minutes. This is troublesome as neither of the studies record the minimum length of time participants were accompanied by a canine for which points towards a lack of validity. Not only because there is no record of participant durations, but because the authors have not deemed the minimum length of time worth recording. Therefore there is no way of determining whether the efficacy of the effect of CAI is influenced by duration.

Handler Effects on Canine Assisted Intervention. While research has been carried out on CAI in a group setting (e.g., Adamle et al., 2009; Binfet & Passmore, 2016; Binfet et al., 2018; Dell et al., 2015), one of the issues with studies exploring the impact of CAI, is the presence of the handler during the intervention, including answering questions about the canine (e.g., Barker et al., 2016; Binfet et al., 2018; Dell et al., 2015; Silas et al., 2019), interacting with participants alongside the canines (e.g. Adamle et al., 2009), or encourage interactions between participants (Wood et al., 2018). Some studies

addressed the impact of having handlers actively involved in the canine sessions and the contribution towards CAI (e.g., Binfet, 2017) who acknowledged the contribution of the handler during the intervention by, for example, being empathetic to the participants issues. In Dell et al.'s (2015) study, the handlers were described as being phenomenal while another described *the lady* as being nice suggesting handlers had a positive effect on the impact of CAI. Given the finding that this social interaction with handlers may enhance the benefits of CAI, the fact that in some studies, handlers were actively involved has implications when drawing conclusions about the effectiveness of CAI. That is, it precludes the ability to ascertain how much of the benefit is a direct result of CAI itself as opposed to the social interaction between participants and handler. Furthermore, having handlers present and actively involved may have encouraged canines to better interact with participants (and vice versa) which could have had an effect on overall results.

Considering the intervention involves a live dog, the presence of a handler is almost impossible to avoid entirely, however their presence and involvement in the intervention is not always accounted for. It is possible for CAI to be carried out with the handler present however the handler must ensure they do not contribute towards the intervention and that their only role is to monitor the canine. This issue is not about having the handler present during the intervention, but when the handler becomes involved in the intervention. By allowing the handler to actively take part and contribute to the session through question and answering, or offering information about the canine or canine program, it becomes difficult to understand whether outcomes are a direct result of CAI only, or the interaction with the human handler, or a combination of both.

In an effort to better understand the effect of canine and handler, Grajfoner and colleagues (2017) included the canine handler as one of the experimental conditions. Participants were placed into one of three groups: the dog and handler group (participants interacted with both canine and handler), a dog group (participants interacted with the canine only), and a handler group (participants interacted with the handler only). The study found an increase in mood and a greater improvement in anxiety in both

groups where the dog was present in comparison to the handler only group which decreased after the intervention. Additionally Grajfoner et al. (2017) found there was no significant difference between the dog only group and the dog and handler group which suggests the presence of the dog contributed to an increase in increase mood.

Study location. An additional issue concerns studies carried out in a busy common area of a popular residents' hall with any number of external influences (Daltry & Mehr, 2015; Dell et al., 2015) as these may have influenced canine behaviour and participants experiences of CAI. In comparison, studies where data collection took place in a private room (e.g. Binfet, 2017) arguably provides more compelling evidence that any effect of CAI is a result of the intervention rather than social influences.

Measures. The lack of pre intervention measures may have an impact on studies who did not use these (e.g. Daltry & Mehr, 2015; Dell et al., 2015). Participants in studies where pre-intervention measures were not used may have been more relaxed compared to studies that did, however without these pre-intervention results this is impossible to know. More importantly, the added benefit of a group and social element, as well as participants choosing to take part or being able to dictate the level and timing of the interaction, may have in turn resulted in a more positive outcome. In addition to this, data collection using informal evaluation forms or purpose created questionnaires (e.g., Daltry & Mehr, 2015; Machová et al., 2020; McArthur & Syrnyk, 2018; Trammell, 2017) could also lead to results being left open to interpretation in comparison to studies using objective standardised measures that have a wealth of evidence supporting usage and validity.

Participants. Two further problematic elements within the 37 studies are age range and sample size. The age range in the 37 studies varied as the youngest participant was 17 and the oldest 57 ($M = 21.17$). This is an issue as different stages of life and development could affect the results with research

supporting the claim that being older may allow one to deal with anxiety or depression by having better control of, or being better at regulating ones emotions (e.g., Lawrie & Phillips, 2016; Scheibe & Blanchard-Fields, 2009). Sample size is also a recurring issue as none of the studies include power calculations to demonstrate sufficient sample sizes. Further empirical research is therefore required on an HE population with adequate sample sizes focusing on appropriate age groups. Internal factors with regards to participants' existing mental health are also often unaccounted for in the studies. In the 33 studies that carried out pre-intervention measures, some participants chose to take part if they self-identified with the study (for example, homesickness, Binfet & Passmore, 2016), and two studies excluded participants undergoing psychotherapeutic treatment (Lass-Hennemann et al., 2014, 2018). Only one study (Machová et al., 2020) reported whether participants had pre-existing mental health conditions or were undergoing other therapy which may affect how they approach and receive CAI and possibly impact results.

Dropout rates. Finally, dropout rates could be an issue. In Dell et al.'s study (2015) large dropout rates were seen introducing a possible issue of characteristic bias between those that stayed and those that dropped out. There may have been an issue with recruitment or the intervention itself may have, for the participant, been unsatisfactory, potentially skewing results if those finding CAI unhelpful subsequently dropped out.

1.5.5 Theoretical Framework

As CAI is in its youth as a form of support for HE students, there is a lack of theoretical frameworks that have been discussed in relation to the mechanisms behind CAI. One possibility is that of mindfulness. Introduced into the mainstream by Dr. Jon Kabat-Zinn whose research includes mindfulness in relation to anxiety (Kabat-Zinn et al., 1992), stress (Kabat-Zinn, 2003), and medicine (Ludwig & Kabat-Zinn, 2008), mindfulness was originally a meditation practice rooted in Buddhism.

The concept of mindfulness is based on the practice of focusing on being in the moment, or what one is feeling at that moment, rather than on ones' issues or a singular focus (Kabat-Zinn et al., 1992). One possibility is that the mechanism of what participants experience during CAI, like mindfulness, is based in the moment. Participants experience CAI through the enjoyment of interacting with a canine and it is this interaction that diverts the focus from what the issues are that cause anxiety, stress or depression.

An alternative and more plausible theory relates to Attention Restoration Theory (ART). One of the elements of ART recommends that one steps away from the source or everyday factors that cause stress (Ohly et al., 2016). It has been suggested by Kaplan and Kaplan (1989) that being in contact with nature and the natural environment has a beneficial impact on well-being, and a positive impact on restoring healthy effective functioning. Alongside this, and like that of peer reviewed CAI studies, research has found an impact of green spaces on stress (Thompson et al., 2012), depression (Berman et al., 2012), and signs of anxiety, stress and depression (Beyer et al., 2014). Based on the work of Kaplan and Kaplan (1989), it is reasonable to propose that ART has the power to restore or renew one's attention after mental exertion. Considering the mental exertion experienced by students during their time in HE, which impacts anxiety, stress and depression, a link between the application of ART and nature, and ART and CAI, is clear.

The process of CAI connects with the four main components of ART; being away, soft fascination, extent and compatibility (Ohly et al., 2016). 'Being away' relates to distancing oneself from the issues that cause anxiety, stress and depression. The use of a canine acts as a tool distracting the participant from their current issues or worries. 'Soft fascination' refers to being able to hold one's attention with little effort. Being with a canine fulfils this objective as the dog acts as a stimulating activity and the participants attention is absorbed elsewhere. 'Extent' is the feeling of being comfortable. Interacting with a canine in relation to addressing emotions is very different to a traditional talk therapy where the participant may worry the human therapist will judge them and their issues. The canine is unlikely to be seen as a judgmental entity. This non-judgmental CAI session transitions into

a restorative environment and encourages the participants to be engaged with the canine and immerse themselves in the experience. Finally, ‘compatibility’ is the idea that participants have an intrinsic motivation to take part, and in doing so, they experience an enjoyment of their environment. That is, participants who opt to take part in CAI do so for their own personal reasons and the environment has a better chance to be restorative.

These four elements alongside research that suggests ART has an impact on attention restoration and mental fatigue (Pearson & Craig, 2014) become important as they begin to frame CAI as a means to support the increase of mental health issues experienced by HE students as discussed in the literature review (Chapter 1). If one accepts that CAI mirrors the use of nature in ART, working to distract a student from the issues that cause anxiety, stress and depression, CAI begins to fit into the concept of ART. The link between ART as an established theoretical framework and CAI is further supported by research that mirrors CAI in its exploration of stress in HE students (Felsten, 2009), general anxiety (Beyer et al., 2014), stress (Thompson et al., 2012), and depression (Berman et al., 2012), and other elements HE students may experience such as mental fatigue (Hartig & Staats, 2006), or benefit from such as being calm and reflective (Moran, 2019).

1.5.6 Summary

This chapter, including a systematic and literature review introduces CAI and explores the effects of canine interactions used in an educational context. In doing so the discussion revealed that CAI is used with positive results in both school and HE settings, with particular focus on the benefits of CAI on a range of mental health issues experienced by HE students. The majority of studies discussed in this chapter demonstrated that CAI has a positive impact on anxiety and stress, and that mental health is a growing issue for HE students, therefore it is possible that CAI could be a suitable intervention to help support students during their time at university.

In addition, this chapter demonstrates that despite the many differences in study design and intervention type, CAI has often been found to have a positive effect on the mental health of HE students particularly in addressing anxiety and stress levels. There was also evidence that social aspects of group CAI had a positive influence and may enhance the beneficial effects. However there are a number of studies that found a lack of effectiveness of CAI which may have been avoided had the authors controlled for external factors. One limitation of this systematic review is the inability to carry out a meta-analysis. While this was one of the initial aims of the review, after reviewing the relevant studies it became apparent that study design, intervention activity and duration, location and measurements used were far more diverse than expected. As a result of this diversity, and the mix of comparisons of different treatments with different comparators, it was decided that each combination needed to be considered separately. The outcomes themselves are also quite diverse, leading to further difficulties with a meta-analysis. Despite this weakness, the systematic review demonstrates that specific protocols, a manual or guidelines, have yet to be produced that can be followed when conducting CAI to ensure optimum results are achieved. This chapter also frames CAI within the theoretical framework of ART concluding that CAI acts as an enjoyable distraction from the issues that contribute towards HE students anxiety, stress and depression levels.

To conclude, with canine interaction as a form of therapy slowly becoming more acceptable and discussed widely in both academic and anecdotal forums, universities are starting to implement canine interaction as a potential form of therapy to support the mental health of HE students. However, it is important to remember that there were a number of studies that found no significant impact on anxiety and stress, and that the studies that focused on depression did not find the same positive impact of CAI on depression as with anxiety and stress. In addition, much of the CAI research is flawed in its nature, design, and execution of the study. What is apparent is that while a range of study designs exist, best practice study design has yet to be identified and components such as duration, human-to-canine ratio or location need further research to identify optimum parameters for effective CAI. Therefore a manual

or guide recommending key elements required for effective CAI, such as intervention duration or the number of participants taking part as a group would help to establish best practice which could begin to identify optimum parameters and build a framework for effective and efficient CAI, ensuring participants experience the positive effects of CAI.

1.5.6 The Current Thesis

1.5.6.1 Thesis Aim

Taking inspiration from current CAI research, this thesis aims to reach beyond traditional practice to support students and explores whether CAI has an effect on the mental health of HE students, specifically on their levels of anxiety, stress, depression and general well-being.

To date, there are a number of elements missing from CAI research. (1) There is a lack of empirical CAI research using a RCT study design, (2) a lack of focus of the benefits of CAI on depression and (3), a lack of CAI research that measures a range of CAI durations to identify whether there is a specific length of time CAI should be applied to have the best effect. In addition, there is some conflict between anxiety and stress findings, and while research into CAI does have participants take part in groups, there is no research that explores the impact of CAI on the mental health of HE students taking part in a range of group sizes in comparison to taking part individually. This thesis aims to address all these elements and contribute towards improving the effectiveness of CAI by establishing optimum conditions required for effective CAI.

1.5.6.2 Structure of the Current Thesis

Chapter 2 - Methodology. The purpose of the methodology is to detail the overall research design used in this thesis. This includes a summary of the thesis aims and independent and dependent variables, research approach, and ethics relating to the study, participants, and canines. Participant

details and materials will be presented alongside a justification of standardised measures, canines and location used for data collection. Finally the study procedures and data analysis for each study will be outlined.

Chapter 3 - Study 1: A Randomised Controlled Trial Investigating the Effects of Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students. While key literature demonstrates a beneficial effect of CAI on the mental health of HE students, there is a lack of research comparing a CAI (experimental group) against a control group using a RCT design. Therefore the objective of this study is to explore the benefits of CAI on anxiety, stress, depression and general well-being in students in Higher Education using an RCT. Participants from Middlesex University will be randomly assigned to either a CAI or control group. Participants will take part individually. Those in the CAI group will interact with a canine for 10 minutes whereas participants in the control group will watch a power point with unrelated images for 10 minutes.

Chapter 4 - Study 2: A Randomised Controlled Trial Demonstrating the Effectiveness of Brief Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students. Following on from study 1, the objective of study 2 is to determine the optimum duration of CAI. The study will also explore the impact of canine features on CAI and the interaction activity during CAI. Students from Middlesex University will participate individually and will be randomly assigned to either a 2 minute CAI group, a 5 minute CAI group, a 10 minute CAI group or the control group. Participants in the CAI groups will interact with a canine for 2, 5 or 10 minutes. Those in the control group will watch a power point with unrelated images for 10 minutes. As study 2 will also explore whether the canines features or the type of interaction between human and canine will have an impact on CAI, all CAI groups will be asked to answer questions on their opinion of the canines

features after the intervention is completed. All CAI participant sessions will be recorded. Six pre-set interactions will be used to examine whether these have an influence on the benefits of CAI.

Chapter 5 - Study 3: Grouped Canine Assisted Intervention No More Effective Than Individual Participation: An Exploration of Canine Assisted Intervention Participation on Higher Education Student Mental Health. The objective of study 3 will be to explore the influence of a social element on the impact of CAI. Participants from Middlesex University will be randomly assigned to either take part in a CAI session either individually, in a group of two or in a group of three. Additionally study 3 will explore whether participants interaction style influences the benefits of CAI in a group setting.

Chapter 6 - Discussion. The discussion chapter will evaluate the overall findings of the three individual studies and draw conclusions based on these. The strengths of the thesis will be discussed alongside the implications for CAI, and a framework for effective CAI will be outlined. To conclude, the implications for future work and limitations of this thesis will be discussed.

Chapter 2

Methodology

In chapter 1, a systematic and literature review presented a detailed exploration of 37 empirical studies that have used canines as an intervention in a HE population. While the review demonstrated some of the reviewed studies concluded that CAI has a positive effect on the mental health of HE students there are some conflicting results. A number of studies found that CAI was no more effective than a comparison intervention, and in some cases, the comparison intervention had a greater impact on the measured domain. There were also several limitations of the research which included a lack of control groups and RCT, the location and external influences during data collection, and specificity in study design such as exact durations, participant group numbers and the number of canines per participant or session. This chapter will discuss the research approach of the current thesis, as well as outlining the methodology implemented in the studies.

2.1 Summary of Aims

Chapter 1 outlined the aims of the current thesis in detail. To summarise, the thesis aims to explore the effectiveness of CAI on improving the mental health of HE students, specifically anxiety, stress, depression, and well-being. Additionally, the thesis aims to determine whether, (1) there is an optimum duration of CAI for it to be effective, (2) canine traits influence the impact of CAI, and (3) taking part in groups is more effective than taking part individually. The thesis also aims to understand (4) the interaction activities between human and canine, and (5) participant interaction style as predictors of the experiences of CAI on reducing anxiety, stress, depression, and well-being.

2.2 Research Approach

It was essential to adopt an appropriate research method that had been carefully considered and well planned. When considering the methods of data collection, it was also important to factor in those involved in data collection, alongside the needs of the research. It was important to ensure participants

did not experience respondent fatigue due to the number of measures, or any discomfort when interacting with the canine. It was also vital to consider the canine and their needs, and that they were not stressed or anxious as a result of the study. A quantitative approach using statistical analysis of data collected through questionnaires and observable interactions (that can be quantified) was therefore adopted. Given the nature of the studies (RCT and experiments), it was deemed important that all participants receive the same treatment. Indeed, one of the main strengths of quantitative research, especially when using self-report standardised measures, is that every participant receives exactly the same measure delivered in exactly the same format. Data collection may therefore be deemed fairly reliable as although all external variables cannot be controlled, there are less researcher influences in the way of data collector bias that are more prevalent in qualitative research. Additionally, the anonymity of choosing an answer that best suits can allow for a more reliable truth rather than participants choosing not to speak their truth in fear of being judged. Similarly, participants are able to contribute with little emotional trauma that may be encountered through a more probing qualitative approach.

In order to ensure results were directly in response to the intervention, a RCT design (studies 1 and 2) and an experimental, between groups design (Study 3) was used, whereby the relationship between CAI and the effect on anxiety, stress, depression, and general well-being could be analysed. Random allocation of participants to the intervention groups ensured the experimental design was unbiased.

RCT's are considered to be a rigorous study design used to explore the relationship between cause and effects (Sibbald & Roland, 1998). In addition, RCT's have been used on a HE student population to measure facets of mental health including anxiety (Ginsburg et al., 2021), anxiety and stress (Ahmed et al., 2020; Eather et al., 2019), anxiety and depression (Bendtsen et al., 2020), and depression, anxiety, and stress (Ritvo et al., 2021). RCT's have also been used to measure the impact of CAI on HE students by Barker et al. (2016), Binfet (2017) and Griscti and Camilleri (2020) who identified a reduction in stress levels after interacting with a canine. Additionally, Spruin et al. (2020)

used a RCT to measure the effect of canine interaction on HE students' anxiety and mood. To be considered an RCT, the allocation of respondents to an experimental and control group must be random, and all intervention groups must go through the same procedure except for the intervention activity. Sullivan (2011) argues RCT's are the *gold standard* when considering clinical research as they are quantitative and comparative, and within educational research, the application of a RCT should reduce allocation bias by distributing participant characteristics between the groups. In doing so, this should assist in there being an influence in the overall outcome. However, it is not a fool proof method and issues of unbalanced participants characteristics and systematic differences between groups may still occur.

2.2.1 Ethics

Ethical approval for all three studies (Appendix B) was given by the Psychology Research Ethics Committee at Middlesex University. Given the nature of the studies, additional consideration was given to ensure both human participants and canines were protected and cared for.

2.2.2 Safeguarding Human Participants

To protect participants all data was made confidential with names removed and replaced with numbers. All participants were fully informed of the nature of the research including the purpose of the study, what they would need to do as participants, the advantage, and disadvantages of taking part, that data collected was only for use in this PhD thesis and for publication in journal articles. Participants were also informed they could withdraw at any point during the data collection process. To emphasise the withdrawal process, participants were also verbally informed that they could leave the interaction session at any point if they felt uncomfortable. Across the three studies, no participants chose to withdraw. All participants gave their informed written consent and demographic details to take part in

the study. Participants were excluded from participation if they had a fear of dogs or if they were allergic to animals. This was for their own protection and to ensure their mental health was cared for.

2.2.3 Safeguarding Canines

The study followed specific procedures to ensure the canines used in the studies experienced no animal cruelty during their time at Middlesex University. To ensure the canines were comfortable with their surrounds they were allowed to run free in the laboratory, where all data collection took place, for 15-20 minutes prior to the first CAI session. They also had frequent walks outside between sessions. Additionally, they were taken outside if they showed any signs of needing a comfort break and a puppy pad was placed in the room. A safe place in the corner of the lab was provided to create a sense of security for the canines allowing them a place to retreat to if they needed a break from human contact. To safeguard the canines, no more than four sessions a day were booked, and while participants completed measures the canines were given a break and allowed to run free in the lab for 20-25 minutes (out of sight of the participant). Signs of distress or upset were monitored for. This included obvious signs that both the researcher and participant would recognise such as aggressive or persistent barking, crying, trembling, or standing and staring at the door, and less obvious signs such as persistent licking, yawning, squinting of the eyes, pacing, or panting for no reason (Case, 2015; Mariti et al., 2012). At no point in all three studies, did either of the canines display any of these behaviours.

2.2.4 Participants

Participants were recruited from Middlesex University for all three studies. As all psychology students at Middlesex University are required to take part in research as research participants, the universities online psychology experiment sign up system, SONA, was used: an online management software that allows researchers to recruit participants. The advantage for this study is a direct link to 300+ possible candidates. However to address the issue of a select population, additional posters were

put up on all teaching sites around campus, the library, and main college building to recruit a wider range of students.

The inclusion criteria for all studies was that participants must be enrolled in a university (indicating being a HE student). A total of 215 participants (181 females, 34 males) took part across the three studies (Table 3). In study 1 no age limit was set and students ranged in age from 18-52 however on analysing the data, it was felt that the age range of 19.1 - 52 years may not represent a typical HE student age. Therefore studies 2 and 3 had an age cap of 25. In study 2 participants ages ranged from 18 - 24 years, and in study 3 participants ages ranged from 18-25 years. Exclusion criteria included a fear of, or allergy towards canines. To protect the canines, any participant who answered *yes* when asked if they had previously harmed an animal were also excluded from the study. No participant answered *yes* therefore no students were excluded based on this criterion. When data collection started for study 3, Middlesex University survey policy had changed, and participants were also asked if they were fluent in reading and spoken English. The ethnic background of students ranged in all three studies (see Table 3). In study 1, 21.70% of participants had canines at home, in study 2 this increased to 22.70%. Having a canine at home was found to have no impact on the effect of CAI in either of the first two studies, therefore this date was not collected in study 3.

Table 3

Participants Demographics Details of All Three Studies Including Age, Gender, Whether They Had a Canine at Home and Ethnicity.

Variable	Study 1	Study 2	Study 3
Total participants (Female/Male)	60 (47/13)	88 (75/13)	67 (59/8)
Total age range (years) (mean/SD)	19.1 - 52 (25.3/6.99)	18 - 24 (19.70/1.5)	18 - 25 (20.69/2.10)
Female mean age /SD	25.8/7.35	19.61/1.40	20.76/2.01
Male mean age/SD	23.4/5.35	20.23/1.79	20.13/2.75

Canine at home	21.70%	22.70%	n/a
Ethnicity			
White background	48.30%	39.77	54.22%
White and Black African or Caribbean mix	3.30%	5.68%	2.99%
White and Asian mix	3.30 %	5.68%	2.99%
Black, African or Caribbean background	11.70%	22.73%	8.96%
Arab	-	-	5.97%
Chinese	-	-	2.99%
Any other ethnic group	31.70%	19.32	17.91%
Other mix group	-	2.27%	
Chose not to state	1.70%	4.55%	2.99%

2.3 Materials

2.3.1 Measures

A wide range of standardised measures and visual analogue scales were used to collect data during the three studies. These evolved over the course of the studies based on effectiveness and suitability of measuring the effectiveness of CAI.

Visual Analogue Scales (VAS).

Anxiety, Stress and Depression (Studies 1, 2, & 3, Appendix C). Visual analogue scales were chosen to measure subjective anxiety, stress and depression based on their effectiveness in measuring similar traits used in studies with an HE population (Binfet et al., 2018; Huang et al., 2020; Khoshhal et al., 2017). In particular Barker et al. (2016) and Binfet et al. (2018) have both used a VAS to measure HE student stress levels in response to a canine interaction and demonstrated a single VAS was appropriate as a one off measure. Visual analogue scales are well suited for repetitive use as respondents are not bound to a set of predefined categories where choosing one statement may not quite fit how they feel, instead, respondents are able to choose whereabouts on the scale better represents how they feel (Klimek et al., 2017). Klimek et al. (2017) also suggests the use of a VAS reduces social desirability

bias as it is difficult for respondents to predict what value is expected of them. It is possible the use of a VAS is disadvantaged if participants are uncertain of the number that best represents their anxiety, or if the question is unclear to the participant. However, the software used in this thesis (Qualtrics) takes into account where participants place their mark on the scale and allocates this to the closest corresponding number, similar to rounding up or down in statistics. Additionally the questions asked relate to one word emotions which reduces the possibility of misinterpretation or participants not understanding the question. The VAS consists of an evenly marked 10-point horizontal line with for example *extremely anxious* at one end of the scale to *not at all anxious* at the other end of the scale. Participants were given written instructions on how to complete the VAS by indicating on the scale how anxious they felt at that current moment.

Visual Analogue Scales Well-being. VAS-Optimism, Confidence, Cheerfulness, Relaxation, Feeling Loved (Study 3, Appendix D). The Well-being VAS followed the VAS design above and was used to measure optimism, confidence, cheerfulness, relaxation, and levels of feeling loved in HE students (VAS are described above under materials). These facets were chosen as they complement the five elements of well-being (Rath & Harter, 2010) as well as feelings related to anxiety, stress, and depression.

Visual Analogue Scales Canine Traits. (VAS-CT, Study 2, Appendix E). The VAS-CT was used to measure students' perceptions of the canine, specifically looking at whether participants felt the canine was juvenile or adult in appearance, cute, friendly, loveable, playful, good natured and cuddly. The VAS-CT scale was represented by an evenly marked 10 point line with *very* at one end to *not at all* at the other and only participants who interacted with a canine were asked to rate the dogs on this scale.

The Depression, Anxiety, Stress Scale (DASS).

The Depression, Anxiety, Stress Scale. (Study 1, Appendix F). The DASS-21 (Nieuwenhuijsen, et al., 2003) was chosen to measure anxiety, stress, and depression. There is a lack of empirical research using the DASS to measure the benefits of CAI however it has been frequently used in a HE population (e.g., Basudan et al., 2017; Hall et al., 2018; Lu et al., 2018). Study 1 used the shortened version of the DASS, the DASS-21, consisting of 21 questions. Reported to be more suitable for research work in comparison to the full DASS which is more suited to clinical work (University of New South Wales, 2018), the DASS is a self-reporting measure and is easy to administer and complete. As the DASS measures depression, anxiety, and stress rather than only one element, the subscales have been found not to be independent of each other and are moderately inter-correlated (Lovibond & Lovibond, 1995). Consisting of seven questions for each domain (anxiety, stress, and depression), participants were given written instructions to read the statement and indicate a response rated on a four-point scale that best applied to them. Responses ranged from *did not apply to me at all* to *applies to me very much or most of the time*. The overall score range for the DASS ranges from 0-120 and 0-42 for individual subscales.

Anxiety.

The Depression, Anxiety, Stress Scale (Study 1, Appendix F). The DASS (described above) was used to measure anxiety levels in HE students. The anxiety subscale consists of seven four-point scale questions that respondents answered based on which statement best suits how they feel.

Visual Analogue Scales - Anxiety (Studies 1, 2, & 3, Appendix C). The VAS-Anxiety (VAS described above under materials) was used to measure subjective anxiety levels in HE students. Students indicated on a 10 point line where they felt best matched their anxiety levels.

State Trait Anxiety Inventory (STAI, Studies 1 & 2, Appendix G). The STAI (Spielberger et al., 1983) was used for its ability to measure both self-reported state anxiety; how a respondent feels at that moment in time, and trait anxiety; an indicator of how one generally feels. Only the state measure was used in this thesis to measure the impact of a one off intervention. Similar to the VAS, the STAI has been used effectively in a HE student population to measure anxiety levels in CAI based studies (Buttelmann & Römpke, 2014; Grajfoner et al., 2017; Wilson, 1987, 1991; Wood et al., 2018). The STAI is suitable for general use in research and lends itself well to an educational setting as it is simple to apply and complete. The STAI state scale is comprised of 20 statements and has a score range of 20-80. Participants were given written instructions to rate how they felt in relation to each statement on a four-point scale ranging from *not at all* to *very much so*.

Stress.

The Depression, Anxiety, Stress Scale (Study 1, Appendix F). The DASS (described above) was used to measure stress levels in HE students. The stress subscale consisting of seven questions on a four-point scale that participants answered based on which statement best matched how they felt.

Visual Analogue Scales - Stress (Studies 1, 2, & 3, Appendix C). The VAS-Stress (VAS described above under materials) was used to measure subjective stress levels in HE students. Using a 10 point line the students indicated where on the line they felt best described their stress levels.

Perceived Stress Scale (PSS, Study 2, Appendix H). The PSS (Cohen et al., 1983) has been used with nursing and medical students to measure perceived stress (e.g., Grobecker, 2016; Gupta et al., 2017; Ye et al., 2018). Additionally Roberti et al. (2006) used the PSS to measure stress levels in HE students as it accounts for personal or contextual factors which may influence how one perceives stressful situations as being stressful, something previous stress measures do not often account for. Participants

were given written instructions to rate the 10 questions on a 5 point scale ranging from *never* to *very often*. The PSS has a score range of 20-80.

Depression.

Visual Analogue Scales - Depression (*Studies 1, 2, & 3, Appendix C*). The VAS-Depression (VAS described above under materials) was used to measure subjective depression levels in HE students. The students indicated on a 10 point line where they felt their depression levels lay.

The Depression, Anxiety, Stress Scale (*Study 1, Appendix F*). The DASS (described above) was used to measure depression experience by HE students. The depression subscale is made up of seven questions on a four-point scale. Respondents answered based on which statement best suited how they felt.

Becks Depression Inventory (BDI), (*Studies 1 & 2, Appendix I*). The BDI (Beck et al., 1996) has been used to measure depression levels in HE students (Ediz et al., 2017; Hart Abney, et al., 2018; Sakellari, 2020). Additionally Shearer et al. (2016) used the BDI to explore the effects of a therapy dog on HE student depression levels. In a study carried out that included 1206 Icelandic students, Arnarson et al. (2008) found psychometric properties of the BDI supported this population. The BDI consists of 21 questions rated on a four-point Likert-type scale. Participants selected the one that best described how they felt. The BDI has a score range of between of 0-63.

Well-being.

Checklist Individual Strength (CIS), (*Study 1, Appendix J*). The Checklist Individual Strength (Beurskens et al., 2000) was used in Study 1 as it measures subjective feelings of fatigue, concentration, motivation, and physical activity. All four are common feelings related to well-being, however given

the requirements of HE, concentration and motivation are two feelings HE students may experience on a regular basis and are most likely to identify with. In a study measuring fatigue in HE students, Lee et al. (2007) found the CIS was able to differentiate between fatigued rates and fatigued and non-fatigued students. The measure consists of 20 questions and is subdivided based on the four elements (fatigue [8 questions], concentration [5 questions], motivation [4 questions] and physical activity [3 questions]). Participants were instructed to rate their responses on a seven-point scale ranging from *yes that is true* to *no that is not true*. The subscale scores ranged from 8-56 for fatigue, 5-35 for concentration, 4-28 for motivation, and 3-21 for physical motivation giving an overall score ranging from 20-140.

Ryff Scale of Psychological Well-being (Ryff, Study 1, Appendix K). The Ryff Scale (Ryff, 1989) was used in Study 1 as it is specifically recommended for use in an HE population (Siefert, 2005). The strength of the Ryff Scale is the construction of the measure which is based on six individual domains (autonomy, environmental mastery, purpose in life, self-acceptance, personal growth and positive relations with others). Studies that have used the Ryff to measure psychological well-being in HE students include Kyeong, (2013), Otálora and Barros (2014) and Hu and McCormick (2012). The scale consists of six elements of well-being and is comprised of nine questions per element totalling 54 questions. Written instructions to participants instructed them to read the question and select the response they felt might represent them and their lives. Responses are rated on a six-point scale ranging from *strongly agree* to *strongly disagree*. The individual subscale scores range from 9-54 except for autonomy which ranges from 14-49 giving an overall score range of 59-310.

Warwick-Edinburgh Mental Wellbeing Scales (WEMWBS, Study 2, Appendix L). The Warwick-Edinburgh Mental Well-being Scale (University of Warwick, 2015) was used to measure well-being in study 2. Measuring six elements of well-being (optimism, autonomy, clarity of thought, confidence, feeling relaxed and cheerfulness), the WEMWBS measures well-being in adults and is

considered suitable to measure the efficacy of an intervention in improving mental health (University of Warwick, 2015). The WEMWBS has been used with a HE population in the UK (e.g., Cilar et al., 2020; Gorczynski et al., 2020; Kannangara et al., 2018). The WEMWBS is comprised of 14 questions and participants responded on a five point scale ranging from *none of the time* to *all of the time*. The WEMWBS has a score range of between 14-70.

Personal Well-Being Index (PWI, Study 3, Appendix M). The PWI (International Wellbeing Group, 2013) was used to measure student well-being. The PWI has been used to explore an Aboriginal well-being intervention on first year social work students (Whiteside et al., 2017), and as a standardised measure to assess well-being in gifted university students (Sayler et al., 2015). Having removed the two optional questions, the final PWI consists of seven questions. Responses were rated from 0-10 ranging from *no satisfaction at all* to *completely satisfied* and scores range from 0-70.

Interaction Style.

Vulnerable Attachment Style Questionnaire (VASQ, Study 3, Appendix N). Developed to assess attachment style in relation to depression, the Vulnerable Attachment Style Questionnaires (Bifulco et al., 2003) was used to measure participant interaction style in study 3. The VASQ measures insecure attachment style and two additional subscales: (1) insecurity/mistrust and (2) degree of proximity/distance. The VASQ has been used in studies with HE students to predict mental health and psychosocial well-being in students transitioning to HE (Carr et al., 2013), and in predicting cortisol response to group psychosocial stress in female HE students (Smyth et al., 2015). Comprised of 22 questions participants base their responses on a five-point Likert-type scale ranging from *strongly agree* to *strongly disagree*. While the VASQ does not determine attachment style, Bifulco et al. (2003) reports insecurity/mistrust correlates with the fearful and angry-dismissive attachment style while the high proximity seeking correlates with the enmeshed style. Additionally, cut off scores can be used to

indicate disorder risk, e.g., combining scores from insecurity and proximity seeking dimensions can indicate a high vulnerability in style and an anxious attachment style, and insecurity and low proximity seeking can indicate an avoidant attachment style (Bifulco et al., 2003). The VASQ scores range from 22-110 for the insecure attachment style, 12-60 for the insecurity/mistrust and 10-50 for the degree of proximity/distance

Rational for Measures Used.

The main rationale behind the use of these specific standardised measures was that they had been applied in peer reviewed research with an HE population. This was the case with the DASS (Hall et al., 2018; Lu et al., 2018), STAI (Buttelmann & Römpke, 2014; Grajfoner et al., 2017), PSS (Gupta et al., 2017; Ye et al., 2018), BDI (Shearer et al., 2016), Ryff (Kyeong, 2013, Otálora & Barros, 2014), WEMWBS (Cilar et al., 2020; Gorczynski et al., 2020) and VASQ (Carr et al., 2013, Smyth et al., 2015). Additionally, some of the measures had been used in CAI research with HE students as participants as was the case with the STAI (Buttelmann & Römpke, 2014; Grajfoner et al., 2017) and BDI (Shearer et al., 2016).

VAS are a useful tool for assessing characteristics or symptoms, including anxiety, stress, depression and well-being. They are simple in application and use, require no formal training and are also easy to reproduce (Klimek et al., 2017). Generally attributed to Hayes and Patterson (Marsh-Richard et al., 2009; Yeung & Wong, 2019), the VAS is portrayed as a continuum helping to prevent a cluster of results. Presented with regular intervals, participants interpret these as being equally sized differences meaning results from a VAS lends well to arithmetic calculations (Klimek et al., 2017). Reported as having excellent reliability in a study in both a literate and illiterate geriatric population with knee pain (Alghadir et al., 2018), the VAS has also been used to measure subjective experiences in a paediatric population (McCormack et al., 2009).

The VAS was used in this thesis based on its success in both an HE population and in CAI research. Both Barker et al. (2016) and Binfet et al. (2018) used a VAS to measure stress in an HE population and found that stress levels were reduced post canine intervention. The VAS was also successfully used by Delgado et al. (2018) in measuring a reduction in stress in HE students post canine intervention alongside physiological markers.

As self-report scales, both the standardised measures and VAS ask participants to report their own levels of anxiety, stress, depression and well-being which limits the risk of researcher bias. They are also quick and easy to use and apply, and participants are able to answer honestly without fear of being judged. The choice to use self-reported measures also follows all 37 CAI papers discussed in the systematic review (Chapter 1), however it is important to remember that social desirability and demand characteristics may occur.

2.3.2 Variables

The independent variable differs across the three studies. The dependent variables, anxiety, stress, depression, and well-being, remain the same.

Chapter 3: Study 1

- Independent variables -
1. Group (experimental vs control)
 2. Phase (pre intervention vs post intervention)

Chapter 4: Study 2

- Independent variables -
1. Group (2 minute CAI vs 5 minute CAI vs 10 minute CAI vs control)
 2. Phase (pre intervention vs post intervention)

3. Canine (Elvis vs Dahlia)

Predictor variable - 1. Interaction activity

Correlate - 1. Canine features

Chapter 5: Study 3

Independent variables - 1. Group (individual CAI vs paired CAI vs trio CAI)

Predictor variable - 1. Interaction Style

2.3.3 Canine

The three studies in this thesis used two canines. Elvis (aka Fathead, Figure 3), a three year old Dachshund, Jack Russell cross and Dahlia (Figure 4), a one year old Chihuahua, Yorkshire Terrier cross. Both canines frequently interact with people other than their owners and enjoy the attention they receive. They are both used to traveling on the London Underground therefore are used to being in busy surroundings. Study 1 used Elvis as the canine, study 2 used both Elvis and Dahlia to explore the influence of particular canine traits, and study 3 used only Dahlia.

Figure 3

Elvis the Dog Used During the Interaction in the CAI Groups in Studies 1 and 2



Figure 4

Dahlia the Dog Used During the Intervention in the CAI Groups in Studies 2 and 3



2.3.4 Location

All data collection took place on campus at Middlesex University. Two different rooms were used and both rooms allowed for the participant and canines to be separated using a screen or door while the participant completed questionnaire measures. Both rooms had plenty of space for the canine to run around when they were on a break, and for the participant and canine to interact without crowding each other.

2.3.5 Hardware

All data was collected using Qualtrics on 3 Amazon Fire HD 8 tablet (7th Generation) or a MacBook Air 13", OS X El Capitan, 10.11.6. In addition a MIUI 10.0.4 smart phone was used to record participant interactions with a canine in study 2.

2.3.6 Software

Qualtrics, an online survey system was used to run the questionnaires for all three studies. A PowerPoint presentation was created for the control group intervention in study 1 and 2 showing 20 unrelated neutral images. Each image was shown for 30 seconds, in random order and in colour (see Chapter 2 for general methodology). In study 2, an observation software (Noldus, Version 11) was used to code recorded observations on six pre-set interaction activities.

2.3.7 Procedure

All three studies involved human and canine interaction however the procedure differed slightly in all three studies. This section will outline procedure that was the same across all three studies followed by the differences (full details are reported in each of the studies in later Chapters).

All data collection took place in a lab on campus at Middlesex University through pre-arranged appointments. The study durations ranged from 50 minutes (Study 1), 25-40 minutes (Study 2, depending on the intervention group), and 30 minutes (Study 3). After ensuring participants met all inclusion criteria (no fear of dogs, no allergy towards animals and had not purposely harmed an animal), participants completed a demographics questionnaire including questions on age, gender, course and level, and ethnic background. Study 1 and 2 asked participants whether they had a canine at home whereas study 3 asked participants whether they liked canines, measured on a five-point scale ranging from *like dogs* to *dislike dogs*.

General procedure.

Pre-intervention: Before the intervention, participants were provided with the measures of anxiety, stress, depression, and well-being specific to each study. The canine was kept out of sight during pre-intervention (and post-intervention) so that all measures were completed before participants saw the canine to prevent any possible effect of the canine on pre-measure results.

Intervention: The intervention consisted of interacting with the canine for a set duration which ranged across all three studies. Participants were informed the level of interaction was for them (the individual participant) to establish. They could choose to either sit in the room with the canine or interact however they felt comfortable. Interactions included talking to, petting, or playing with the canine. A ball was provided as a toy if the participant wished to use it. Participants were told the researcher would stay in the room in sight of both canine and participants to monitor timing of the session and the canine but would not take part in the intervention. No visual or physical interaction occurred between the canine and participant while the participant was completing both pre and post measures to prevent any possible effect of the canine on pre or post-measure results. In addition there was no interaction with any other persons on site and all data collection took place in the same room without any distractions. While the interaction itself was the same across all three studies, the form and context of the intervention differed depending on different groups in each study. In study 1, participants were randomly assigned to either the CAI group who interacted with the canine for 10 minutes, or the control group who watched a power point with unrelated images for 10 minutes. In study 2, participants were randomly allocated to one of three intervention duration groups: 2 minute CAI, 5 minute CAI or the 10 minute CAI group, or the control group who watched the unrelated power point for 10 minutes. In study 3, participants took part in either the individual CAI group, who interacted with the canine alone, the paired CAI group who interacted with the canine with one other participant, or the trio CAI group who interacted with the canine with two other participants present. All CAI lasted 2 minutes. No control group was used in study 3.

Control groups (Study 1 & 2) received no CAI and were instead given a neutral task of watching a power point with unrelated neutral images (e.g., a teapot, guitar) taken from the British Vocabulary Scale (Dunn & Dunn, 2009) for the duration of their intervention. No images contained pictures of animals or emotive stimuli. Participants were informed the experimenter would remain in the room but would not take part in the intervention.

Post-intervention: The questionnaire measures were presented to all participants for a second time. The measures were completed in the same order as pre-intervention. In study 2 the CAI groups were presented with an additional measure asking them to rate the canines' traits. At the end of the session participants were fully debriefed. This included information on the aim of the research, who participants could contact to learn more about pet/animal therapy or if they required support regarding their own mental health. Participants also had the opportunity to ask questions about the study or Elvis and Dahlia.

2.4 Data Analyses

While statistical analyses differed slightly across the three studies, some tests were used consistently across the studies. In all analyses, Alpha = 0.05 was set as the rejection criterion.

A preliminary analysis was carried out to determine whether having a canine at home had an impact on results (studies 1 & 2), or whether participants liked dogs or not (Study 3). Where no significant effect was found, these variables (having a canine or liking dogs) were excluded from subsequent analyses. In study 1 T-tests were conducted to check for baseline differences between participants before the intervention. In studies 2 and 3 a one-way ANOVA was used. Correlation analyses were then conducted to explore concordance between measures pre-intervention and post-intervention.

All three studies used analysis of variance (ANOVA) to examine whether CAI was effective in reducing anxiety, stress, and depression, and improving well-being. Each chapter specifies the type of ANOVA used. In study 1, a two-way 2(group: CAI vs. control) × 2(phase: pre vs post) interaction mixed ANOVA was used (between subjects on the first factor and within subjects on the second). Significant interactions were followed up with simple effect analyses. Study 2 used two-way 4(2 minute CAI vs 5 minute CAI vs 10 minute CAI vs control) × 2(phase: pre vs post) interaction mixed ANOVA (between subjects on the first factor and within subjects on the second). Significant interactions were

again followed up with simple effects analyses. Study 3 used two-way 3(group: individual CAI group, paired CAI group, trio CAI group) \times 2(phase: pre vs post) interaction mixed ANOVAs on all measures (between subjects on the first factor and within subjects on the second). Simple effects analyses were carried out following significant interactions.

Studies 2 and 3 included additional analyses. Study 2 used change scores in a correlation analysis to explore the relationship between measures of anxiety, stress, depression and well-being, and canine traits. Additionally, hierarchal regression was carried out to predict whether six pre-determined interactions, (1) no interaction with the canine (no interaction), (2) only watching the canine without any physical or vocal interaction (watching only), (3) petting the canine without any vocal interaction (pet no vocal), (4) petting the canine with vocal interaction (pet vocal), (5) playing with the canine with a toy without any vocal interaction (play toy no vocal), or (6) playing with the canine with a toy and vocal interaction (play toy with vocal), predicted anxiety, stress, depression, and general well-being. In study 3, a hierarchal regression was used to determine whether interaction style predicted the effectiveness of CAI.

Chapter 3

Study 1

A Randomised Controlled Trial Investigating the Effects of Canine Assisted Intervention on Anxiety, Stress, Depression, and Well-Being in Higher Education Students *

Mental health issues in HE students are becoming increasingly common (McKenzie et al., 2015) with one fifth of university students struggling with some form of mental health disorder (Auerbach et al., 2016). Brown (2016) suggests that students are vulnerable to mental health issues due to the key elements that many students face as part of the university experience. This includes homesickness as a result of leaving home and losing their support network alongside the stress of taking onboard debt, trying to understand and function in a new learning environment, and the pressure that comes with securing a high class degree (see Chapter 1).

Currently, general support available to students in HE follows an established and traditional route (Thorley, 2017), however these strategies may be limiting as it has been suggested there is a mistrust of those providing the support, and that services and support are often duplicated (Mowbray et al., 2006). Additionally, there is anxiety around obtaining psychological help related to the negative perceptions of having mental health issues (Goodman, 2017).

CAI is gradually become a form of support that universities are starting to adopt to address some of the mental health issues students experience (Adamle et al., 2009; Daltry & Mehr, 2015; Dell et al., 2015; Grajfoner et al., 2017). While there is research evidence for the use and benefit of CAI in a HE student population (e.g., Binfet & Passmore, 2016, Hall, 2018; Shearer et al., 2016), there is a lack of RCT designs (MacArthur & Syrnyk, 2018; Silas et al., 2019; Thelwell, 2019) and the use of control groups (Delgado et al., 2018, Wood et al., 2018). In addition, results are conflicted in some studies (e.g., Barker et al., 2016), comparison interventions have been found to be more effective than CAI (e.g., Buttelmann & Römpke, 2014; Shearer et al., 2016), and in some (e.g., Daltry & Mehr, 2015; Dell et al., 2015) no pre intervention measures were taken to compare post measures against (see Chapter 1 for full details).

Based on the lack of scientific rigor in the design of current CAI research, this study will use a randomised control trial design utilising a suitable control group to explore the benefits of CAI on anxiety, stress, depression, and general well-being in HE students. Additionally, strict guidelines will be adhered to to ensure results focus on the benefit of interaction with a canine rather than from other influences. This includes no interaction (including any visual opportunities) with the canine while pre and post measures are being completed, no social interaction from other persons on site including the canine handler, and all data collection will take place in the same quiet room where participants can focus on the canine and completing all measures without distraction.

The aim of this study is, therefore, to investigate whether there is significant benefit of CAI to HE students in order to further understand the potential therapeutic value of this interaction. Participants were randomly assigned to either receive CAI or an unrelated intervention to investigate the effect of CAI on HE students' levels of stress, anxiety, depression, and general well-being. It was hypothesised that the canine interaction group would experience a greater reduction in anxiety, stress, and depression levels, as well as an increase in overall well-being, compared to the control group.

3.1 Method

3.1.1 Participants

Sixty HE students (47 females and 13 males) were recruited from Middlesex University. Based on Cohen's (1988) recommended power of .80, power calculations suggested that the sample size was adequate to detect a medium effect size. Participants were randomly assigned to one of two groups, the CAI group, who took part in CAI for 10 minutes or the control group who watched the unrelated power point for 10 minutes. The age range of participants was 19.1 years to 52 years with a mean age of 25.3 years, SD = 6.99 (female = 25.8 years, SD = 7.35, male = 23.4 years, SD = 5.35). Of the 60 participants, 66.70% (n=40) were undergraduate students, 33.30% (n=20) were postgraduate students, and enrolled on a range of courses. 21.70% (n=13) reported having a canine at home. Of the 60 participants 48.30%

(n=29) were of White background, 3.30% (n=2) White and Black African, 3.30% (n=2) White and Asian mix, 11.70% (n=7) Black, African or Caribbean background, 31.70% (n=19) any other ethnic group and 1.70% (n=1) chose not to state their ethnic background. Ethical approval was obtained by the Psychology Research Ethics Committee and all participants provided signed written consent to take part in the study (Appendix B).

Participants were informed that the aim of the study was to measure self-reported stress, anxiety and depression levels and general well-being and that some participants may have the opportunity to interact with a small canine. Exclusion criteria included a fear of canines, allergies towards animals and whether the participants had purposely harmed an animal.

3.1.2 Materials

The study was carried out using Qualtrics on a MacBook Air 13", OS X El Capitan, 10.11.6. For the control group, a PowerPoint presentation was used to display 20 unrelated neutral images (see Chapter 2, General Methodology). All images were presented for 30 seconds in colour and in random order.

A small Dachshund, Jack Russell cross called Elvis (see Figure 3 in Chapter 2), who grew up with small children, was used in the study for the CAI intervention. Frequently travelling by train, he is used to people and enjoys the attention. Elvis was with his handler at all times and was monitored for signs of distress.

3.1.3 Questionnaire Measures

Five standardised questionnaires were used to identify levels of anxiety, stress, depression, and well-being, alongside three visual analogue scales (VAS) also measuring anxiety, stress, and depression. Full details of each measure can be found in the methodology chapter (Chapter 2). Measures are represented here according to the order they were presented to participants.

The VAS (Appendix C) was designed to measure current subjective anxiety, stress and depression with participants instructed to indicate on the scale their current levels of anxiety, stress, and depression.

The BDI (Beck et al., 1996, *Appendix I*) was used to measure depression and had a high internal consistency pre-intervention, Cronbach's $a = .92$, and post-intervention, $a = .93$.

The CIS (Beurskens et al., 2000, *Appendix J*) measured well-being with specific reference to fatigue, concentration, motivation, and physical activity. Pre-intervention, Cronbach's $a = .65$, and post-intervention, $a = .71$. For the individual subscales, fatigue internal consistency was poor, pre-intervention, $a = .55$, and questionable, post intervention, $a = .65$. Concentration was unacceptable, pre $a = .41$, and post-intervention $a = .48$, motivation was also unacceptable, pre $a = .11$, and post-intervention $a = .30$, as was physical activity pre-intervention $a = -.17$, and post-intervention $a = .06$.

The STAI (Spielberger et al, 1983, *Appendix G*) was also used to measure participants anxiety levels at that moment in time. Internal consistency was high pre-intervention, Cronbach's alpha (a) = .88, and post-intervention, $a = .92$.

The DASS (Nieuwenhuijsen et al., 2003, *Appendix F*) was used to measure anxiety, as well as stress and depression. For anxiety, pre-intervention, Cronbach's alpha was relatively high, Cronbach's $a = .75$, and post-intervention, $a = .86$. For stress, internal consistency was high pre-intervention, Cronbach's alpha (a) = .85, and post-intervention, $a = .90$. Finally, the Cronbach for depression was high pre-intervention, $a = .88$, and post-intervention $a = .90$.

The Ryff (Ryff, 1989, *Appendix K*) was used to measure well-being related to autonomy, environmental mastery, purpose in life, self-acceptance, personal growth, and positive relations with others. Cronbach's alpha was high pre-intervention, $a = .94$, and post-intervention, $a = .95$.

3.2 Procedure

This study followed the general procedures outlined in the methodology chapter (Chapter 2). Participants were tested individually in a lab on campus at Middlesex University having been given pre-arranged appointments. The total duration of the study was approximately 50 minutes, and all participants were first asked to complete a demographics questionnaire having met the inclusion criteria and signed a consent form.

Pre-intervention: Measures were presented to both groups in the same order (VAS-Anxiety, VAS-Stress and VAS-Depression, BDI, CSI, STAI, DASS, and RYFF).

Intervention: Participants were randomly assigned to one of two groups, the CAI group, or the control group. The CAI group interacted with the canine for 10 minutes and both the level and form of interaction was left to the participant to establish. The experimenter remained in the room and if asked about Elvis the experimenter answered questions if they pertained to the study but otherwise was not actively involved in the intervention. The control group received no CAI but watched a power point with unrelated neutral images for a period of 10 minutes instead. No images contained pictures of animals.

Post-intervention: The questionnaire measures were completed in the same order as pre-intervention (VAS-Anxiety, VAS-Stress and VAS-Depression, BDI, CSI, STAI, DASS, and RYFF), followed by a full debrief and the opportunity to ask questions regarding Elvis or the study.

3.3 Results

3.3.1 Statistical analysis

Correlation analyses were first conducted to check concordance between measures pre-intervention (Table 4) and post-intervention (Table 5). Two-way 2 (group: CAI vs control) \times 2 (phase: pre vs post) mixed ANOVAs were carried out on all measures to determine statistically significant differences. Significant interactions were followed up with simple effect analyses. Alpha = 0.05 was

set as the rejection criterion in all analyses. Effect sizes are reported as partial eta-squared (η^2_p). Having a canine at home had no significant influence on the analyses therefore was excluded from all reported analyses.

Table 4*Correlation Between all Measures at Pre-Intervention*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 VAS-Anxiety	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2 VAS-Stress	.42*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 VAS- Depression	.39*	.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 BDI	.19	.17	.48*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 CIS-Fatigue	.16	.03	.10	.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6 CIS-Concentration	.02	.01	-.15	.03	.41*	-	-	-	-	-	-	-	-	-	-	-	-	-
7 CIS-Motivation	.14	.17	.08	.20	.19	.38*	-	-	-	-	-	-	-	-	-	-	-	-
8 CIS-Physical Activity	.10	.02	-.10	-	.12	.29*	.30*	-	-	-	-	-	-	-	-	-	-	-
9 STAI	.05	.26*	.04	.29*	.17	.19	.49*	-.37	-	-	-	-	-	-	-	-	-	-
10 DASS- Depression	.24	.34*	.27*	.33*	.27*	.30*	.36*	.01	.52*	-	-	-	-	-	-	-	-	-
11 DASS-Anxiety	.36*	.25	.25	.44*	.25	.25	.26*	-.06	.41*	.64*	-	-	-	-	-	-	-	-
12 DASS-Stress	.28*	.23	.31*	.50*	.28*	.14	.34*	-.15	.47*	.74*	.71*	-	-	-	-	-	-	-
13 RYFF-Autonomy	-.15	-.06	-.07	-.04	-	.03	-.20	.07	-	-.21	-.24	-.27	-	-	-	-	-	-
					.26*				.35*									

14	RYFF-Environmental Mastery	.005	-.19	-	-.16	-	-	-	-.06	-	-	-	-	.37*	-	-	-	-	-
				.003		.26*	.30*	.52*		.70*	.51*	.33*	.42*	*					
15	RYFF-Personal Growth	.08	-.23	.05	.20	-.20	-.20	-	-.05	-	-	-.15	-.13	.46*	.48*	-	-	-	-
								.34*		.42*	.36*			*	*				
16	RYFF-Positive Relations with Others	-.16	-.15	-.22	-.21	-	-.15	-	.09	-	-	-	-	.46*	.56*	.52*	-	-	-
						.26*		.32*		.47*	.56*	.49*	.45*	*	*	*			
17	RYFF-Purpose in Life	-.02	-.20	.07	-.08	-.18	-	-	-.12	-	-	-	-	.27*	.68*	.66*	.48*	-	-
							.32*	.42*		.66*	.60*	.31*	.34*		*	*	*		
18	RYFF-Self- Acceptance	-.05	-.10	-.24	-.25	-	-.04	-	.12	-	-	-	-	.50*	.76*	.50*	.59*	.54*	-
						.29*		.42**		.54*	.54*	.31*	.50*	*	*	*	*	*	

* p < .05, ** p < .01, *** p < .001

Table 5*Correlation Between all Measures at Post-Intervention*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 VAS-Anxiety	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2 VAS- Stress	.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 VAS-Depression	.49*	.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 BDI	.15	.19	.30*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 CIS-Fatigue	.14	.30*	.32*	.27*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6 CIS-Concentration	.07	.08	.18	-.02	.30*	-	-	-	-	-	-	-	-	-	-	-	-	-
7 CIS-Motivation	-.07	.22	-.02	-.02	.32*	.35*	-	-	-	-	-	-	-	-	-	-	-	-
8 CIS-Physical Activity	-.04	-.08	.06	.008	.24	.34*	.29*	-	-	-	-	-	-	-	-	-	-	-
9 STAI	.11	.40*	.13	.08	.18	.14	.40*	-.15	-	-	-	-	-	-	-	-	-	-
10 DASS-Depression	.26*	.22	.19	.36*	.16	.27*	.31*	.007	.54*	-	-	-	-	-	-	-	-	-
11 DASS-Anxiety	.37*	.28*	.28*	.42*	.26*	.31*	.30*	-.04	.47*	.77*	-	-	-	-	-	-	-	-
12 DASS-Stress	.17	.18	.15	.54*	.20	.22	.22	.05	.49*	.84*	.74*	-	-	-	-	-	-	-
13 RYFF-Autonomy	-.17	-.25	-.06	-.18	.03	-.04	-.23	.31*	.36*	-	-.21	-	-	-	-	-	-	-
14 RYFF-Environmental Mastery	.06	-.04	.04	.007	.09	-	-	-.03	-	-	-.20	-	.37*	-	-	-	-	-
						.36*	.40*		.43*	.48*		.30*	.44*					
						*	*		*	*		*	*					

15	RYFF-Personal Growth	-.04	-.29*	-.01	.004	-.13	-	-	-	-	-	-	-	.55*	.52*	-	-	-	-
16	RYFF-Positive Relations with Others	-.15	-.18	.05	-.06	.01	-.21	-	.05	-	-	-	-	.46*	.53*	.58*	-	-	-
17	RYFF-Purpose in Life	.004	-.09	.03	.11	.03	-	-	-.01	-	-	-.21	-	.37*	.71*	.83*	.56*	-	-
18	RYFF-Self-Acceptance	.03	-.04	.02	.04	-.04	-	-.25	.04	-	-	-.12	-.19	.41*	.59*	.51*	.41*	.54*	-

* p < .05, ** p < .01, *** p < .001

3.3.2 Pre-existing Differences

T-tests were conducted on all pre-intervention measures to check for pre-existing differences before the intervention. There was a significant difference between the CAI group and the control group at pre-intervention for the VAS-Depression scores, $t(58) = 2.45, p = .017$, BDI scores, $t(58) = 3.29, p = .002$, DASS-Depression scores, $t(58) = 2.83, p = .006$, RYFF-Environmental Mastery scores, $t(58) = -2.43, p = .018$, and the RYFF-Self-Acceptance scores, $t(58) = -2.99, p = .004$. These pre-existing differences must be taken into account when interpreting the results and will be discussed further in the discussion.

3.3.3 Correlation Analyses

Correlation analyses were carried out to examine the strength of the relationship between pre (Table 4) and post-intervention (Table 5) measures. While some significant correlations were found (pre intervention, VAS-Anxiety and DASS-Anxiety, and STAI and DASS-Anxiety, VAS-Depression and BDI, BDI and DASS-Depression and VAS-Depression and DASS-Depression, and post intervention, VAS-Anxiety and DASS-Anxiety, STAI and DASS-Anxiety, VAS-Depression and BDI, and BDI and DASS-Depression), many expected correlations were either low or non-significant.

3.3.4 Anxiety

Figures 5a, 5b and 5c show mean scores for all anxiety measures, pre and post-intervention, in the CAI and control group. Figure 5a shows a reduction in anxiety as measured by the VAS-Anxiety pre-intervention to post-intervention in both groups. A 2×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 58) = 7.54, p = .008, \eta^2_p = .12$ (95% CIs [0, 0.27]), but no significant main effect of group, $F(1, 58) = .006, p = .94, \eta^2_p < .01$ (95% CIs [0, .004]), therefore regardless of group, participants were less anxious post-interaction compared to pre-interaction. The phase × group interaction was also not significant, $F(1, 58) = 0.02, p = .89, \eta^2_p < .01$ (95% CIs [0, .01]), demonstrating no significant change in anxiety, as measured by the VAS, from pre-to-post-intervention, based on the intervention type.

Figure 5b displays mean state anxiety scores as measured by the STAI, indicating a slight reduction in anxiety post-intervention in the control group, but a substantially larger reduction in post-intervention anxiety in the CAI group. A 2×2 mixed ANOVA demonstrated a significant main effect of phase, $F(1, 58) = 28.82, p = .001, \eta^2_p = .33$, (95% CIs [.14, 0.49]), no significant main effect of group, $F(1, 58) = 0.72, p = .40, \eta^2_p = .01$, (95% CIs [0, .12]) indicating that there was a reduction in stress regardless of group. Additionally there was a significant phase × group interaction, $F(1, 58) = 19.37, p < .001, \eta^2_p = .25$, (95% CIs [.08, .41]). Therefore there was a significant effect of intervention pre-to-post-intervention that differed across the two groups. In order to identify where the differences lie, simple effect analyses revealed a significant difference pre-to-post-intervention in the CAI group, $F(1, 58) = 47.72, p < .01, r = .67$, but no significant difference pre-to-post-intervention in the control group, $F(1, 58) = 0.46, p > .05, r = .09$. Therefore, CAI was effective in reducing state anxiety, compared to the control group, as measured by the STAI.

DASS-Anxiety scores are shown in Figure 5c, indicating a slight increase in anxiety in the control group and a considerable reduction in anxiety in the CAI group. A 2×2 mixed ANOVA demonstrated no significant main effect of phase, $F(1, 58) = 2.00, p = .16, \eta^2_p = .03$ (95% CIs [0, .16]),

or group $F(1, 58) = 0.18, p = .67, \eta^2_p = .003$ (95% CIs [0, .08]), but a significant phase \times group interaction, $F(1, 58) = 4.59, p = .04, \eta^2_p = .07$ (95% CIs [0, .22]). To follow up the significant interaction, simple effect analyses indicated a significant difference from pre-to-post-intervention in the CAI group, $F(1, 58) = 6.32, p < .05, r = .31$, however no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = 0.26, p = > .05, r = .07$. In line with the results from the STAI, the findings indicate that CAI was effective, compared to the control group from pre-to-post intervention in reducing anxiety as measured by the DASS.

Figure 5a

Pre and Post Mean VAS-Anxiety Scores (with SE bars) for the CAI and Control Group

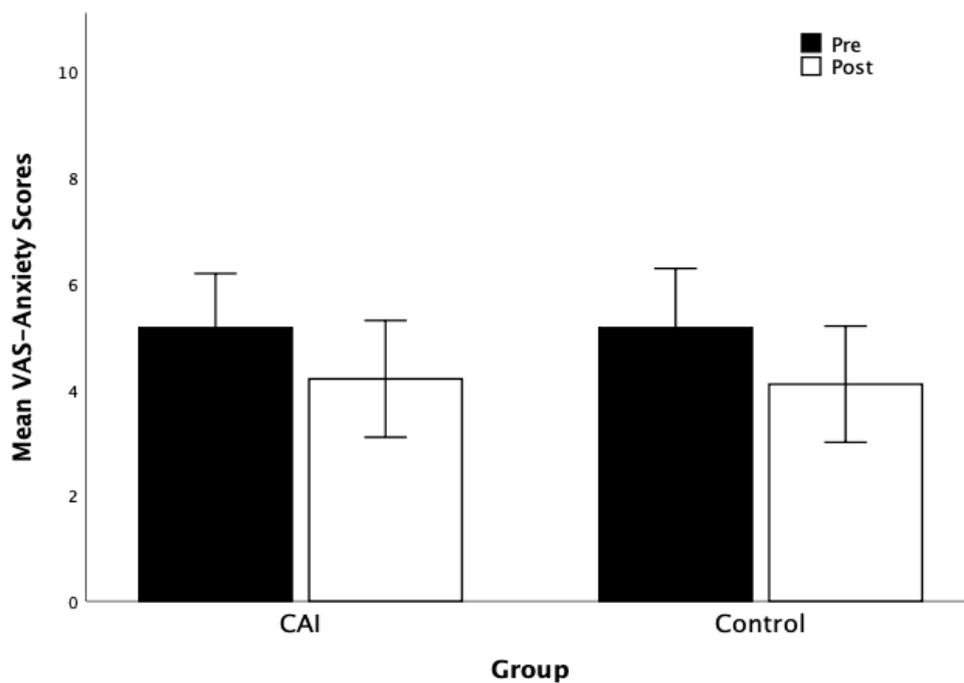


Figure 5b

Pre and Post Mean STAI Scores (with SE bars) for the CAI and Control Group

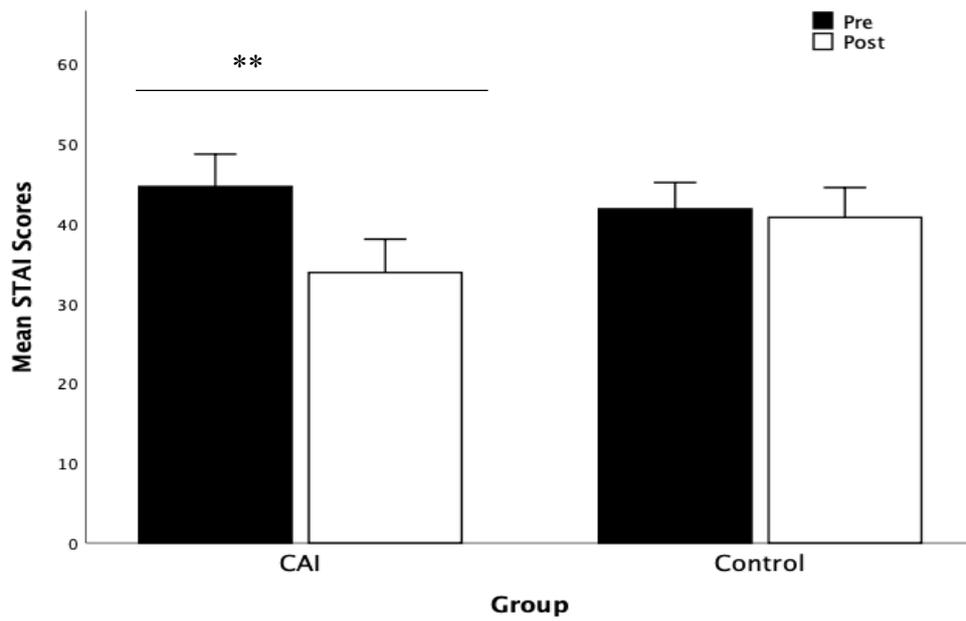
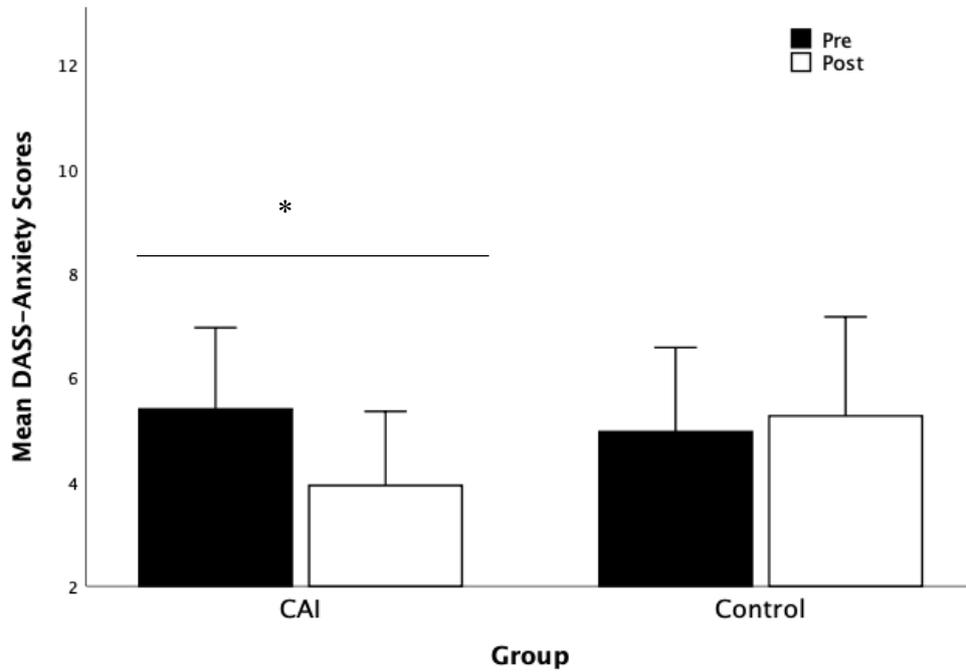


Figure 5c

Pre and Post Mean DASS-Anxiety Scores (with SE bars) for the CAI and Control Group



* $p < .05$, ** $p < .01$, *** $p < .001$

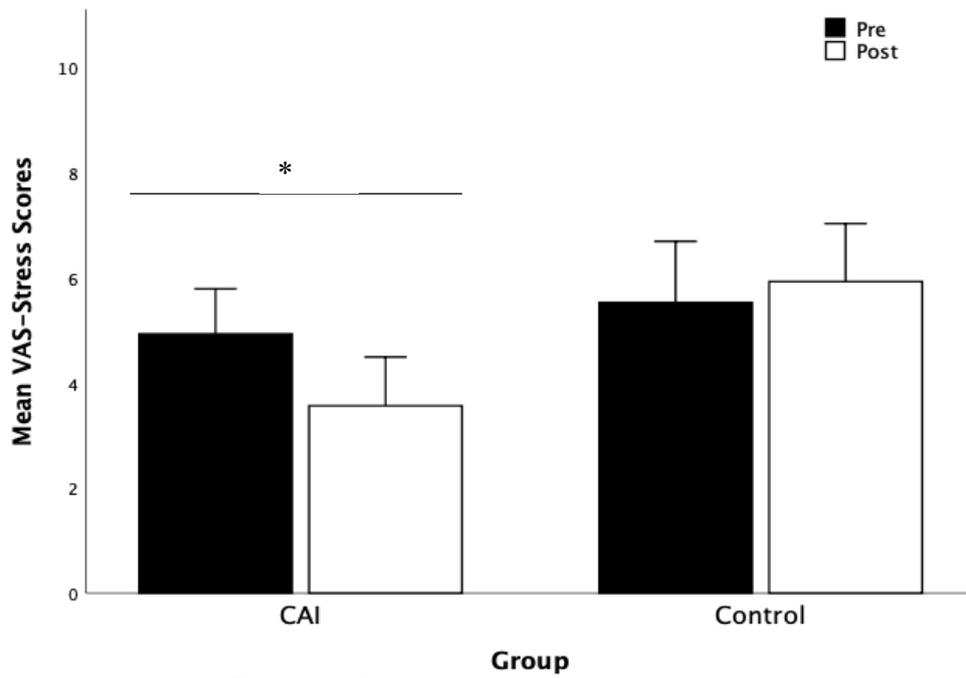
3.3.5 Stress

Figures 6a and 6b displays the pre- and post-intervention scores for the stress measures. Figure 6a shows a slight increase in the control group but a large drop in stress scores in the CAI group in the VAS-Stress. A 2×2 mixed ANOVA revealed no significant main effect of phase $F(1, 58) = 1.46, p = .23, \eta^2_p = .03$ (95% CIs [0, .14]), but a significant main effect of group, $F(1, 58) = 6.50, p = .01, \eta^2_p = .10$ (95% CIs [.004, .26]) and a significant phase × group interaction $F(1, 58) = 4.88, p = .03, \eta^2_p = .08$ (95% CIs [0, .23]). Simple effect analyses revealed a significant difference from pre-to-post-intervention in the CAI group, $F(1, 58) = 11.13, p < .05, r = .40$, but no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = 0.50, p > .05, r = .03$, indicating CAI was effective in reducing stress as measured by the VAS-Stress from pre-to-post-intervention in comparison to the control group.

Figure 6b displays the mean pre-to-post-intervention DASS-Stress scores in the CAI and control group. The graph shows a slight increase in the control group and a reduction in the CAI group. A 2×2 mixed ANOVA demonstrated no significant main effect of phase, $F(1, 58) = 2.81, p = .10, \eta^2_p = .05$ (95% CIs [0, .18]), a main effect of group that approached significance $F(1, 58) = 3.89, p = .05, \eta^2_p < .06$ (95% CIs [0, .21]) and a significant group × phase interaction, $F(1, 58) = 4.72, p = .03, \eta^2_p = .08$ (95% CIs [0, .22]). Simple effect analyses revealed a significant difference from pre-to-post-intervention in the CAI group, $F(1, 58) = 7.43, p < .05, r = .34$, but no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = 1.06, p > .05, r = .13$. In line with the VAS-Stress, these results indicate CAI was effective in reducing stress, compared to the control group, as measured by the DASS- Stress.

Figure 6a

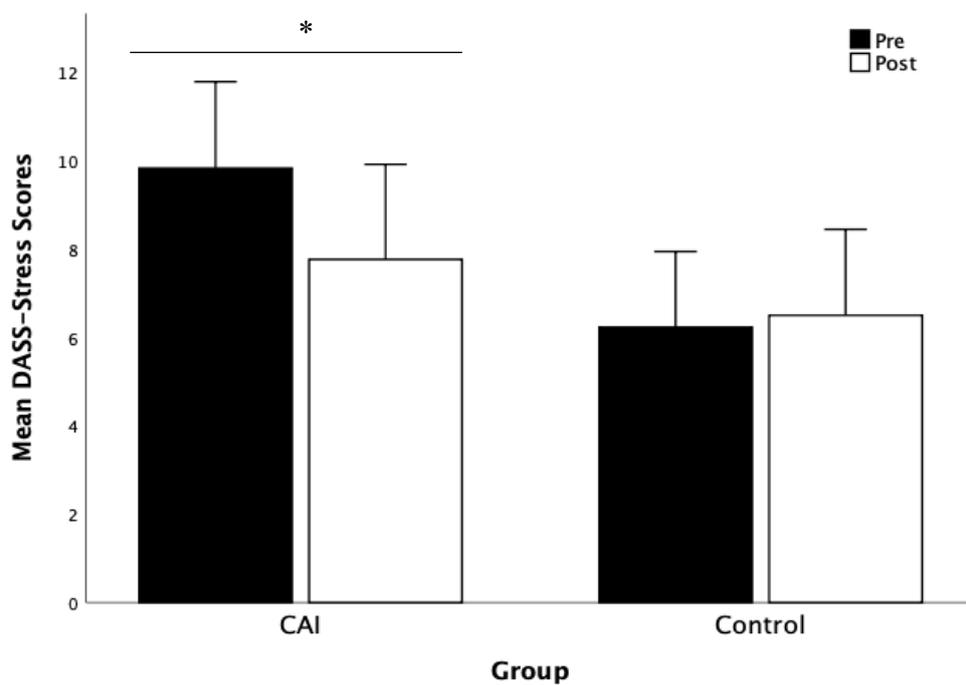
Pre and Post Mean VAS-Stress Scores (with SE bars) for the CAI and Control Group



* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 6b

Pre and post Mean DASS-Stress Scores (with SE bars) for the CAI and Control Group



* $p < .05$, ** $p < .01$, *** $p < .001$

3.3.5 Depression

Pre- and post-intervention scores in each group for the depression measures are shown in *Figures 7a, 7b and 7c*. *Figure 7a* indicates a slight reduction in self-reported depression in the VAS-Depression scores for the control group, but a greater reduction in depression in the CAI group. It is also clear that there are significant differences pre-intervention (see ‘Pre-existing Differences’ above). At pre-intervention, VAS-Depression scores in the CAI group were already higher than the control group meaning the CAI group had a larger scope for a reduction compared to the control group. Indeed, the post-intervention scores for the CAI group are comparable to the post-intervention scores for the control group. The 2×2 mixed ANOVA revealed a significant main effect of phase $F(1, 58) = 9.96, p = .003, \eta^2_p = .15$ (95% CIs [.02, .31]), no significant main effect of group, $F(1, 58) = 1.62, p = .21, \eta^2_p = .03$ (95% CIs [0, .15]), thus regardless of group, participants were less anxious post-interaction compared to pre-interaction. Additionally a significant phase × group interaction $F(1, 58) = 8.83, p = .004, \eta^2_p = .13$ (95% CIs [.01, .29],) was also found. In order to follow up the interaction, simple effect analyses revealed a significant difference from pre-to-post-intervention in the CAI group, $F(1, 58) = 18.81, p < .05, r = .49$, but no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = 0.02, p > .05, r = .02$. Therefore, pre-to-post-intervention, CAI was effective in reducing depression, compared to the control group, as measured by the VAS-Depression.

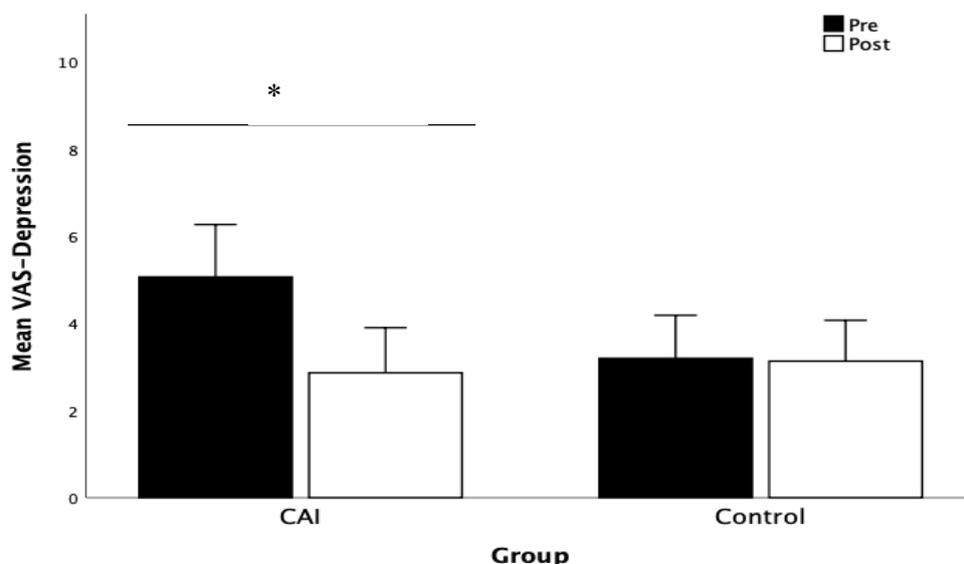
Figure 7b displays the mean BDI scores, pre-and-post-intervention showing a decrease in depression post-intervention in the control group but a much larger reduction in the CAI group. Similar to the VAS-Depression, pre-existing differences were also identified in the BDI. That is, pre-intervention BDI scores were significantly higher in the CAI group compared to the control group. A 2×2 mixed ANOVA demonstrated a significant main effect of phase, $F(1, 58) = 7.23, p = .009, \eta^2_p = .11$ (95% CIs [.007, .27]), and group, $F(1, 58) = 7.58, p = .008, \eta^2_p = .12$ (95% CIs [.008, .27]) and a group × phase interaction that was approaching significance, $F(1, 58) = 3.93, p = .05, \eta^2_p = .06$ (95% CIs [0, .21]). Simple effect analyses revealed a significant difference from pre-to-post-intervention in

the CAI group, $F(1, 58) = 10.90, p < .05, r = .40$, but no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = 8.81, p > .05, r = .36$. These results are comparable to those of the VAS-Depression and indicate CAI was effective in reducing depression as measured by the BDI.

Reductions in the DASS-Depression scores (*figure 7c*) are similar to those found for the BDI. That is, there was a slight decrease in depression in the control group and a considerable reduction in the CAI group. A 2×2 mixed ANOVA indicated no significant main effect of phase, $F(1, 58) = 2.68, p = .11, \eta^2_p = .04$ (95% CIs [0, .18]) or group $F(1, 58) = 0.37, p = .54, \eta^2_p = .006$ (95% CIs [0, .10]) indicating a reduction in depression regardless of group. The phase \times group interaction was non-significant, $F(1, 58) = 1.51, p = .23, \eta^2_p = .03$ (95% CIs [0, .15]) indicating CAI had no significant effect in reducing depression, compared to the control group, as measured by the DASS-Depression. Consideration for these unexpected results can be found in the discussion, however, in brief, the result are likely due to the significant difference in baseline scores found between the two groups.

Figure 7a

Pre and Post Mean VAS-Depression Scores (with SE bars) for the CAI and Control Group



* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 7b

Pre and Post Mean BDI Scores (with SE bars) for the CAI and Control Group

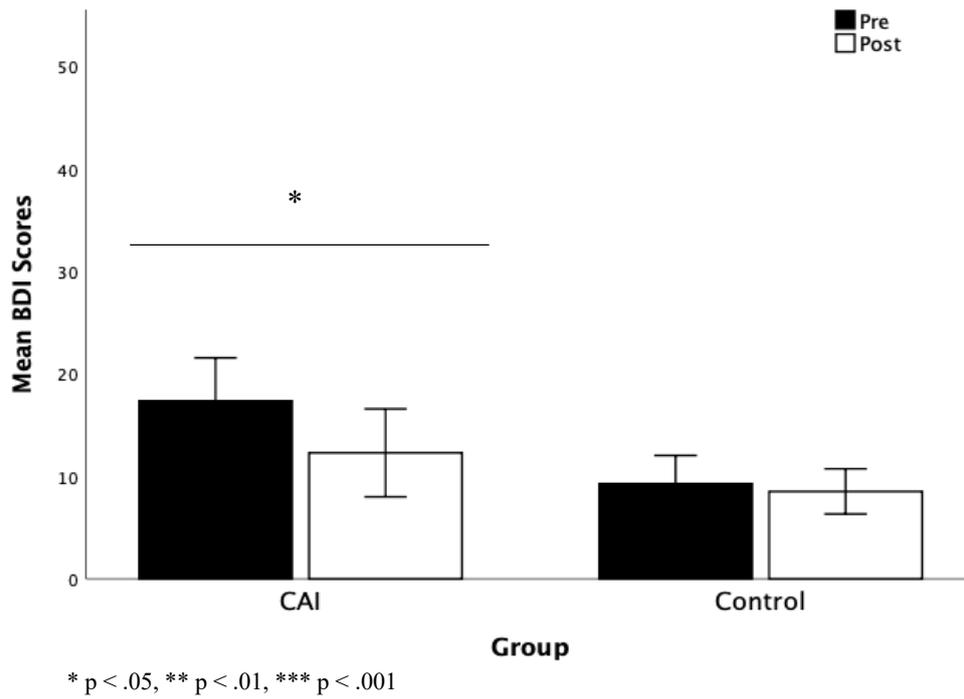
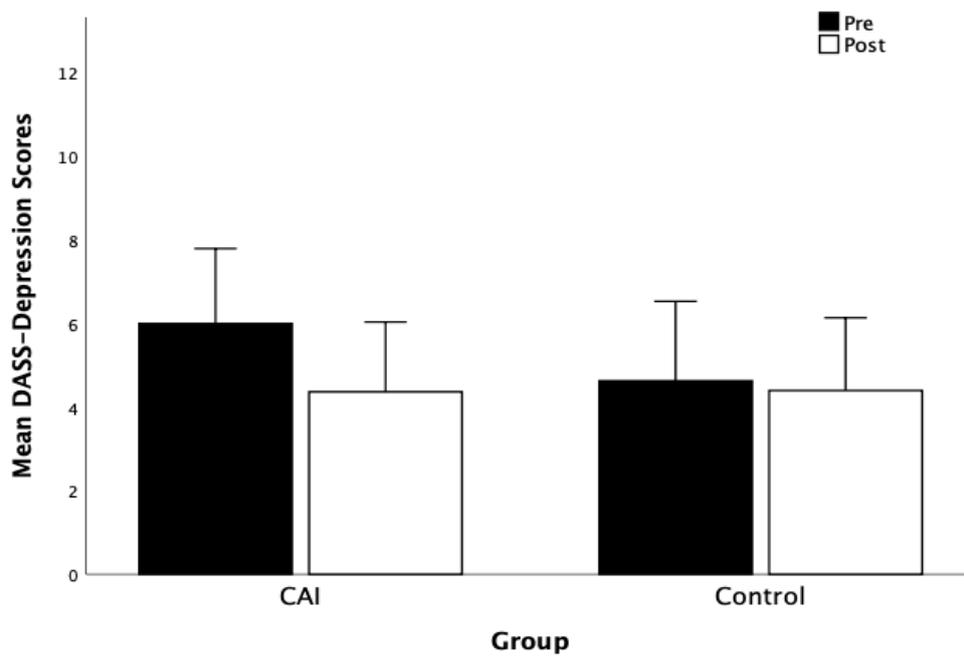


Figure 7c

Pre and Post Mean DASS-Depression Scores (with SE bars) for the CAI and Control Group



3.3.7 Checklist Individual Strength (CIS)

Table 6 displays the mean CIS scores for fatigue, concentration, motivation and physical activity in the CAI and the control group pre and post-intervention. Although there was a decrease in fatigue in both groups post-intervention, the CAI group reported a greater decrease in fatigue. A 2×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 58) = 4.15, p = .05, \eta^2_p = .07$ (95% CIs [0, .21]), no significant main effect of group, $F(1, 58) = 0.46, p = .50, \eta^2_p = .008$ (95% CIs [0, .10]), and no significant phase × by group interaction $F(1, 58) = 3.67, p = .06, \eta^2_p = .06$ (95% CIs [0, .20]). Therefore, there was no significant difference in levels of fatigue between the CAI and the control group, pre and post-intervention. There was also a slight reduction in both groups post-intervention in concentration scores (see Table 6). A 2×2 mixed ANOVA revealed no significant main effect of phase, $F(1, 58) = 0.62, p = .44, \eta^2_p = .01$ (95% CIs [0, .11]), or group, $F(1, 58) = 0.12, p = .74, \eta^2_p = .002$ (95% CIs [0, .08]), and no significant phase × group interaction $F(1, 58) = 0.12, p = .73, \eta^2_p = .002$ (95% CIs [0, .08]). In line with the fatigue results, the findings for concentration scores show no difference between CAI pre-to-post-intervention.

For levels of motivation, there was a slight increase in the control group and a slight decrease in the CAI group from pre-to-post-intervention (see Table 6). A 2×2 mixed ANOVA demonstrated no significant main effect of phase, $F(1, 58) = .003, p = .96, \eta^2_p < .01$ (95% CIs [0, .002]), and no significant main effect of group, $F(1, 58) = 0.06, p = .81, \eta^2_p = .001$ (95% CIs [0, .04]), but a significant phase × group interaction, $F(1, 58) = 7.94, p = .007, \eta^2_p = .12$ (95% CIs [.01, .28]). Simple effects revealed a significant reduction in motivation from pre-to- post-intervention in the CAI group, $F(1, 58) = 4.12, p < .05, r = .26$, and a significant increase in motivation from pre-to-post-intervention in the control group, $F(1, 58) = 9.31, p < .05, r = .37$. The finding that motivation increased in the control group is surprising and will be considered further in the discussion.

The CIS mean physical activity scores show a slight reduction in the control groups and a slight increase in the CAI group post-intervention (see Table 6). A 2×2 mixed ANOVA revealed no significant

main effect of phase, $F(1, 58) = 0.21, p = .65, \eta^2_p = .004$ (95% CIs [0, .09]), or group, $F(1, 58) = 0.25, p = .62, \eta^2_p = .004$ (95% CIs [0, .09]), and no significant phase \times group interaction $F(1, 58) = 1.02, p = .32, \eta^2_p = .02$ (95% CIs [0, .13]). The result therefore indicate no difference in physical activity in the CAI group compared to the control group.

Table 6

CIS Mean Scores (and SD) Pre-to-Post Intervention Scores for CAI and the Control Group

CIS Measure	Group	Pre Mean (SD)	Post Mean (SD)
Fatigue	CAI	37.97 (8.92)	32.50 (10.62)
	Control	36.70 (9.70)	36.53 (8.90)
Concentration	CAI	21.30 (6.77)	20.27 (6.27)
	Control	21.43 (5.59)	21.03 (6.26)
Motivation	CAI	16.20 (5.28)	14.43 (5.70)
	Control	14.77 (4.95)	16.47 (5.31)
Physical Activity	CAI	12.37 (3.90)	12.73 (4.33)
	Control	13.47 (3.98)	12.50 (4.58)

* $p < .05$, ** $p < .01$, *** $p < .001$

3.3.8 Ryff Scales of Psychological Well-being (RYFF)

Autonomy scores, pre-and-post-intervention show an increase in the CAI group and a slight decrease in the control group post-intervention (see Table 7). A 2×2 mixed ANOVA revealed no significant main effect of phase, group or a phase \times group interaction, $F_s < 1$. Similar trends are found in scores of environmental mastery, with a slight increase in mean scores between the CAI group and a slight reduction in the control group, however all main effects and interactions were again non-significant, $F_s < 1$. The same was true for personal growth, positive relations with others, and purpose in life. That is, there were trends towards increases in mean scores for the CAI group and reductions in the control group. However, all main effects and interactions were again non-significant, $F_s < 1$.

Finally, self-acceptance mean scores show an increase in the CAI group and a slight decrease in the control group post-intervention. A 2×2 mixed ANOVA demonstrated a significant main effect of

phase, $F(1, 58) = 4.58, p = .04, \eta^2_p = .07$ (95% CIs [0, .22]), a significant main effect of group, $F(1, 58) = 4.78, p = .03, \eta^2_p = .08$ (95% CIs [0, .23]), and a significant phase \times group interaction, $F(1, 58) = 4.72, p = .03, \eta^2_p = .08$ (95% CIs [0, .22]). Simple effect analysis revealed a significant difference from pre-to-post-intervention in the CAI group, $F(1,58) = 9.30, p < .05, r = .37$, but no significant difference from pre-to-post-intervention in the control group, $F(1, 58) = <.001, p > .05, r = <.001$, indicating CAI was effective in increasing self-acceptance.

Table 7

RYFF Mean Scores (and SD) Pre-to-Post Intervention Scores for CAI and the Control Group

RYFF Measure	Group	Pre Mean (SD)	Post Mean (SD)
Autonomy	CAI	37.20 (7.83)	38.63 (7.26)
	Control	38.10 (6.91)	37.80 (6.69)
Environmental Mastery	CAI	33.17 (8.72)	34.63 (9.25)
	Control	38.03 (6.67)	37.53 (6.36)
Personal Growth	CAI	42.10 (6.80)	43.60 (6.95)
	Control	40.20 (6.84)	39.60 (8.23)
Positive Relations with Others	CAI	37.03 (8.58)	38.53 (9.61)
	Control	38.50 (8.20)	38.00 (7.50)
Purpose in Life	CAI	39.27 (8.45)	40.50 (8.97)
	Control	40.23 (7.97)	38.57 (8.16)
Self-Acceptance	CAI*	32.73 (8.25)	37.33 (9.64)
	Control	39.07 (8.17)	39.03 (6.57)

* $p < .05$, ** $p < .01$, *** $p < .001$

3.4 Discussion

As the first study in this thesis, study 1 used an RCT to investigate the influence of CAI on anxiety, stress, depression, and general well-being in HE students, based on one 10 minute CAI session. Findings are consistent with previous work (e.g., Binfet & Passmore, 2016; Crump & Derting, 2015; Delgado, et al., 2018; Grajfoner et al., 2017) and demonstrate that CAI has a positive effect on some aspects of mental health in HE students. A benefit of the results of this study, in comparison to other CAI research (Adamle, et al., 2009; Daltry & Mehr, 2015; Dell et al., 2015; Wood et al., 2018) is the use of an experimental group (CAI) compared to a control group (no CAI).

The findings of study 1 demonstrate that CAI (1) reduced anxiety levels as measured by the STAI and DASS and (2) reduced stress levels as measured by the VAS-Stress and DASS. One vital finding is that the positive effect of CAI in this study was based on a single 10 minute interaction session. This stands out from previous studies in which participants interacted for longer time periods (e.g., 60 minutes, Dell et al., 2015), for an eight week program of canine interaction (e.g., Binfet & Passmore, 2016), or over 16 points across the academic year (e.g., Hall, 2018).

One finding in this study that is in line with previous research (Shearer et al., 2016) was in relation to the depression measures. The results showed that CAI had no significant impact on depression as measured by the DASS. By contrast, results as measured by both the BDI and VAS-Depression appeared to reveal a significant reduction in the CAI group from pre to post intervention for depression. However, a critical issue arose when interpreting these findings as there were significant pre-intervention differences on all depression measures. This is hugely problematic because it means that the CAI group, who showed significantly greater pre-intervention depression, had a greater scope for reduction in depression by virtue of having higher scores to begin with. In light of this finding, the pre-existing differences must be considered when drawing conclusions as they can result in the findings appearing misleading. The only authentic conclusion that can be drawn from the depression findings is

that the results are uninterpretable and future research is required to unravel whether CAI has an effect on depression.

Participants in this study were randomly allocated to either the CAI group or control group therefore it seems unlikely that the method of randomisation was not sufficient. The reason for these pre-existing differences is therefore unclear. It is possible that it could simply be chance variation, but when looking at the post-intervention scores for the VAS-Depression, it is apparent that scores for the CAI group and control group are very similar. This suggests, potentially, regression toward the mean as an explanation for the apparent effect. That is, while only a minority of participants scored particularly high in depression at pre-intervention, by chance they were in the CAI group, and these particularly highly scoring participants elevated the mean.

A second unexpected finding was that the CAI group showed lower motivation post-intervention compared to pre-intervention. It is possible that participants felt less anxious and stressed (as indicated by other measures) making them feel more relaxed and less motivated to take action (see Smith et al., 2007). It may simply be that the constructs of motivation tested by the measure lacked relevance to participants at the time of testing, or that these elements of the CIS were not sensitive enough to measure motivation as a result of CAI. However that the Cronbach alphas of all four individual subscales (fatigue, concentration, motivation and physical activity) were poor, questionable or unacceptable suggests the measures were unreliable and may account for these findings. Surprisingly few of the facets of well-being were impacted by CAI. It may be that the Ryff and CIS were not sensitive enough to demonstrate differences or were not always relevant to participants, although the RYFF was designed specifically for HE students. Given this lack of results from the RYFF and CIS, neither measure will be used in study 2 as there may be alternative measures of well-being, such as the WEMWBS that was found to have an improvement in well-being after a 20 minute CAI session (Grajfoner et al., 2017), that may be more valid in measuring the impact of CAI

Although the results of study 1 demonstrate that CAI was effective across a breadth of measures for anxiety and stress, results were not entirely consistent across all measures. For instance, pre to post intervention anxiety as measured by a VAS showed no significant difference between the CAI group and control group. The lack of effect for the VAS-Anxiety is difficult to interpret, given that significant differences were found for the VAS-Stress. However as this is the first study of this thesis to utilise a VAS in combination with CAI and the mental health of HE students, and given the significant findings with the VAS-Stress (and VAS-Depression, however note the pre-existing differences), further research is required to decipher whether it is an appropriate tool to measure the impact of CAI in HE students.

A second limitation relates to the number of canines used during data collection. In this study only one canine, Elvis, was used. While Elvis is a friendly dog and enjoyed the attention he received, results could be limited to this particular canine. It is possible other canines with different personalities may be better suited to providing CAI therefore further research should examine the results of CAI using more than one canine. The final limitation relates to the age of participants which ranged from 19.1 - 52. Given that the age of undergraduate students is typically under 24 (Higher Education Statistics Agency, 2019), and that those who most often report mental health issues range from between 18-20, (The Insight Network, 2020), it is possible the age range used in this study does not accurately represent HE students. Further research should focus on using an age range that better represents the current HE undergraduate student population.

The main strength of this study is the use of a RCT as it overcomes many of the limitations discussed in the systematic review (see Chapter 1) by using an experimental approach, an appropriate control group, and a specific duration. The study also took place in a quiet room without interruptions or possible influences unlike studies for which the intervention took place in a busy space on campus (e.g., Daltry & Mehr, 2015; Dell et al., 2015, Hall, 2018) or a grouped environment with a heavy social influence (e.g., Adamle et al., 2009; Muckle & Lasikiewicz, 2017; Ward-Griffin et al., 2018).

Previous research has demonstrated that the social element of the interaction is important in ensuring an effective intervention (e.g., Adamle, et al., 2009; Dell et al., 2015). This study aimed to control and minimise the effects of social interaction. Therefore, the researcher remained uninvolved in the intervention in order to demonstrate that canine intervention is effective in its own right. An additional distinction to other contexts, such as AAI, is that the CAI in the current study did not have specific therapeutic goals defined before the intervention. The objective of the study was to identify how CAI can benefit students in general rather than those with specific conditions as is often the case in AAI.

Taken together, the first study of this thesis extends existing CAI research by using a RCT to demonstrate that a 10 minute CAI is an effective short-term intervention to reduce anxiety and stress in HE students. It also provides an experimental paradigm that can be applied to succeeding experiments that form this thesis. Demonstrating an effectiveness in a brief intervention is fundamental for financial and practical reasons. Given that mental health issues in HE students are on the rise (The Insight Network, 2020, see Chapter 1), if there is a benefit of CAI on mental health in a short duration, more students can take advantage of this in an hour in comparison to longer durations. The implication is that universities will be able to offer an alternative form of support to HE students and begin to address the increase recorded in the mental health of HE students. It is possible that a shorter duration may also be as effective. This would have further implications on financial and practical resources. Therefore, using a range of CAI durations to explore the impact of CAI on the mental health of HE students will be the focus of study two to begin to establish optimum parameters for effective CAI.

- A modified version of this chapter is currently in press (Society and Animals Journal).

Chapter 4

Study 2

A Randomised Controlled Trial Demonstrating the Effectiveness of Brief Canine Assisted Intervention on Anxiety, Stress, Depression and Well-Being in Higher Education Students

The findings of study 1 (Chapter 3) concluded that CAI improves anxiety and stress levels in HE students and provided a RCT paradigm for the use of future studies. The review in chapter 1 revealed a lack of research exploring the parameters of exactly what entails an effective CAI session. One such lack of detail involves how long a single intervention must last to be effective. While there have been a number of studies on the HE population that identify the benefit of CAI on mental health by using specific interaction timings (e.g., Butteltmann & Römpke, 2013 [5 minutes]; Barker et al., 2016 [15 minutes]; Fiocco & Hunse (2017) [10 minutes]; Shearer et al., 2016 [60 minutes]), to the authors knowledge, no studies have directly compared specific interaction timings in one study.

One issue with many of the studies that set either a short ([5-10 minutes] Butteltmann & Römpke, 2014; Crossman et al., 2015; Lass-Hennemann et al., 2014; Wilson, 1987, 1991) or longer duration ([20-60 minutes] e.g., Adamle et al., 2009; Binfet, 2017; Grajfoner et al., 2017; Muckle & Lasikiewicz, 2017), is that while CAI sessions are set within a specific length of time, none of them compared a range of CAI durations. Therefore, the main aim of the current study is to identify whether the duration of the CAI influences the beneficial effects of the intervention.

Alongside identifying an optimal duration of CAI, it is also important to explore whether the physical relationship, or the level of interaction between human and canine has a positive impact on CAI. However, most studies exploring CAI tend to focus on the benefit of interaction with a canine per se, without identifying the type or level of interaction (e.g., Adamle et al., 2009; Muckle & Lasikiewicz, 2017; Trammell, 2017) and participants are free to decide how they interact with the canine (e.g., Daltry & Mehr, 2015; Dell et al., 2015; Wood et al., 2018). This makes it impossible to determine whether the level of interaction with the

canine is a contributing factor towards effective CAI. Therefore the second aim of the current study is to identify whether the interaction activity between human and canine has an impact on the beneficial effects of CAI.

One last factor that may impact the effectiveness of CAI is the canine itself, in particular its features. Neoteny refers to the retention of juvenile features in adult animals (Beck, 2014). Research has demonstrated a preference towards this juvenile appearance in animals that display baby schema; round face, large eyes, small nose, and mouth (e.g., Archer & Monton, 2010; Estren, 2012; Piazza et al., 2018). For example, Fridlund and MacDonald (2015) found that passers-by were more likely to stop and approach a younger puppy compared to an older puppy. Additionally, Borgi et al. (2014) demonstrated that participants spent more time gazing at images of babies, dogs and cats that had been adapted to take on more baby schema or neotenous features which may link to the natural response in humans to be interested in, and take care of babies. To the authors knowledge there is no current research exploring the influence of canine features on the effectiveness of CAI.

In addition to measuring anxiety, stress, depression and well-being, participants will be video recorded during the CAI sessions to explore the timings of six interaction activities, (1) no interaction with the canine (no interaction), (2) only watching the canine without any physical or vocal interaction (watching only), (3) petting the canine without any vocal interaction (pet no vocal), (4) petting the canine with vocal interaction (pet vocal), (5) playing with the canine with a toy without any vocal interaction (play toy no vocal), or (6) playing with the canine with a toy and vocal interaction (play toy with vocal). It is hypothesised that even short durations of CAI will be effective in reducing levels of anxiety and stress in HE students compared to the no intervention control group. Further investigation will also explore whether CAI can influence student depression levels. It is also hypothesised that interactions that allow for physical contact between human and canine (pet no vocal, pet with vocal, play toy no vocal,

play toy with vocal) will predict the effectiveness of CAI in comparison to those with no physical contact (no interaction, watching only). The final hypothesis is that all canine features measured (juvenile or adult in appearance, cute, friendly, loveable, playful, good natured and cuddly) will have a positive impact on the effectiveness of CAI.

To summarise, the current study aims to identify whether the effectiveness of CAI on reducing anxiety, stress, and depression, while also improving well-being in HE students is impacted by (1) the duration of CAI, (2) the type of interaction between human and canine, and (3) the canines' features. Participants will be randomly assigned to one of four groups: CAI with a duration of 2 minutes, 5 minutes or 10 minutes, or a no-canine control group. The durations of 2, 5 and 10 minutes have been selected based on previous research demonstrating that CAI sessions of 5 minutes (e.g., Buttellmann & Römoke, 2014) and 10 minutes (e.g., Fiocco & Hunse, 2017) have a positive effect on mental health in HE students. Direct comparison of these durations within one study will determine whether there is an optimum duration required for effective CAI. The group with a shorter duration of CAI (2 minutes) is important because if it is found to be as effective as 5 or 10 minutes, universities may be more willing to consider CAI as a form of therapy as a briefer intervention arguably has a lower financial and resource impact.

4.1 Method

4.1.1 Participants

Based on Cohen's (1988) recommended power of .80, power calculations suggested a sample size of 88 participants was adequate to detect a medium effect size. All HE students (75 females and 13 males) were recruited from Middlesex University. Participants were randomly assigned to one of four groups: 2 minute CAI, 5 minute CAI and 10 minute CAI groups, and a 10 minute control group. The study recruited undergraduate HE students only,

therefore participants ages ranged between 18 years to 24 years ($M = 19.70$ years, $SD = 1.50$: female $M = 19.61$ years, $SD = 1.40$, male $M = 20.23$ years, $SD = 1.79$). Twenty participants reported having a canine at home. In terms of ethnicity, 35 were of White background, 5 White and Black African or Caribbean, 5 were White and Asian mix, 20 of Black, African or Caribbean background, 17 any other ethnic group, 2 any other mixed group, and 4 chose not to state their ethnic background. Participants took part individually. Exclusion criteria included having a fear of canines, allergies towards animals, and whether the participant had purposely harmed an animal. All participants provided signed written consent to take part in the study and were entered into a competition to win one of two £20 Amazon vouchers. Ethical approval was granted by Middlesex University Psychology Research Ethics Committee.

4.1.2 Materials

Following the design of study 1, the study was carried out using Qualtrics and an Amazon Fire 8 tablet, OS 5.6.4.0 was used to complete data collection. In line with study 1, the control group watched a power point with neutral images for 10 minutes.

4.1.3 Canines

Elvis (see Figure 3 in Chapter 2) was used again in this study. In addition, a small Chihuahua, Yorkshire Terrier cross called Dahlia (see Figure 4 in Chapter 2) was used. As with Elvis, Dahlia also frequently travels by tube enjoying the attention she receives from other commuters. She is used to regular interaction with other people and has successfully completed obedience and reinforcement training. The researcher was in the laboratory at all times to monitor both canines for fear or distress and both canines did not provide CAI for more than four sessions each day. Elvis and Dahlia received regular 20-25 minute breaks between sessions and were made accustomed to the surroundings prior to data collection.

4.1.4 Observation Software

Observer XT software (Noldus, Version 11) was used on a MacBook Air, OS X 10.9 as the observational software, as it allowed for coding and custom analysis design. The videos recorded the six pre-set interactions used to identify the interaction activity between participant and canine. Recording started at the beginning of each participant session and each time the interaction changed the start/stop time was recorded, meaning that for each participant (2 minutes, 5 minutes, and 10 minutes) there is the relevant duration of coding.

1. No interaction - no interaction between participant and canine
2. Watching only - participants only watch the canine
3. Pet no vocal - participants pet the canine without talking to the canine
4. Pet with vocal - participants pet while talking to the canine
5. Play toy no vocal - participants use a toy while interacting with the canine without talking to the canine
6. Play toy with vocal - participants use a toy while interacting and talking to the canine

4.1.5 Questionnaire Measures

To measure levels of anxiety, stress, depression, and well-being, four standardised questionnaires were used alongside three VAS measuring anxiety, stress, and depression. A further eight VAS were used to measure canine traits. Full details of each measure can be found in the methodology chapter (see Chapter 2).

The VAS (Appendix C) was used to measure participants subjective anxiety, stress, and depression before and after the intervention.

The BDI (Beck, et al., 1996, *Appendix I*) was also used to measure depression symptoms. Internal consistency was high pre-intervention, Cronbach's $\alpha = .88$, and post-intervention, $\alpha = .88$.

The STAI (Spielberger et al., 1983, *Appendix G*) was used to measure current subjective anxiety before and after the intervention. The internal consistency for the STAI was high pre-intervention, Cronbach's alpha (a) = .92, and post-intervention, a = .93.

The PSS (Cohen, et al., 1983, *Appendix H*) was used to measure perceptions of, and the degree to which participants found their life stressful. Cronbach's alpha was acceptable at pre-intervention, a = .73, and post-intervention, a = .75.

The WEMWBS (University of Warwick, 2015, *Appendix L*). Based on the findings of study 1 (Chapter 3) that used the Ryff to measure well-being, it was identified there was little impact of CAI on many of the facets of well-being. In addition, the Ryff consists of 54 questions therefore there was a concern of participant fatigue. Study 2 will therefore replace The Ryff with the WEMWBS (14 questions) to measure well-being. Additionally, the WEMWBS, unlike the Ryff, has been successfully used following a 20 minute CAI session (Grajfoner et al., 2017). Cronbach's alpha was high pre-intervention, a = .92, and post-intervention a = .94.

Visual Analogue Scales - Canine Traits: (VAS-CT, Appendix E) were designed to measure perceptions of the canine. The VAS-CT measured eight factors; whether participants felt the canine was juvenile or adult in appearance, cute, friendly, loveable, playful, good natured and cuddly. Participants responded on a 20 point scale with *very* at one end to *not at all* at the other end. Only participants in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups who interacted with a canine completed the VAS-CT. The control group did not complete the VAS-CT as they had no interaction with a canine.

4.2 Procedure

The general procedures outlined in the methodology chapter (Chapter 2) were followed by this study. Participants took part individually and were tested in a lab at Middlesex University. The duration of the study ranged from 25-40 minutes depending on the intervention group. After ensuring participants met all inclusion criteria (no fear of dogs, no animal allergies and had not purposely harmed an animal), participants completed a demographics questionnaire and gave their consent to participate.

Pre-intervention: All measures were completed in the same order (VAS-Anxiety, VAS-Stress and VAS-Depression, BDI, STAI, PSS, WEMWBS), by all four groups (2, 5, 10 minute CAI groups, and the control group). The canine was not present during pre-measures.

Intervention: Participants were randomly assigned to one of four groups: 2 minute CAI, 5 minute CAI and 10 minute CAI group, or the control group. Participants were told the level of interaction was for them (the individual participant) to establish, and that the researcher would stay in the room in sight of both canine and participants to monitor timing of the session and the canine, but not take part in the intervention. Following the design of study 1, the control group were given a neutral task of watching a power point with unrelated (non-animal) neutral images for 10 minutes and received no CAI.

Post-intervention: The measures were presented for a second time in the same pre-intervention order (VAS-Anxiety, VAS-Stress and VAS-Depression, BDI, STAI, PSS, WEMWBS). All CAI groups (2 minute, 5 minute and 10 minute) were also presented with the VAS-CT. Participants were given the opportunity to ask any questions at the end of the study and received a full debrief.

4.3 Results

4.3.1 Statistical Analysis

Correlation analyses were first conducted to check concordance between measures pre-intervention (Table 8) and post-intervention (Table 9). To explore whether CAI reduced anxiety, stress and depression levels, and improved well-being, separate two-way 4(2 minute CAI vs 5 minute CAI vs 10 minute CAI groups vs control) \times 2(phase: pre vs post) mixed ANOVAs were carried out on all measures. Simple effects analyses followed all significant interactions. Alpha = 0.05 was set as the rejection criterion in all analyses. Effect sizes are reported as partial eta-squared (η^2_p).

A hierarchal regression was carried out to explore whether all pre measures of anxiety, stress, depression and well-being (model 1), and the five interaction activities ((1) watching only, (2) pet no vocal, (3) pet with vocal, (4) play toy no vocal, and (5) play toy with vocal), were significant predictors of anxiety, stress, depression, and general well-being (model 2). The 6th predictor (no interaction) was removed from both the analysis as this activity between human and canine did not occur. Finally, a correlation analyses was carried out to explore the relationship between canine traits and anxiety, stress, depression, and general well-being.

Table 8*Correlation Between all Measures at Pre-Intervention*

Variables	VAS-Anxiety	VAS-Stress	VAS-Depression	BDI	STAI	PSS	WEMWBS
VAS-Anxiety	-						
VAS-Stress	.59**	-					
VAS-Depression	.50**	.60**	-				
BDI	.47**	.44**	.63**	-			
STAI	.66**	.53**	.62**	.73**	-		
PSS	.32**	.38**	.47**	.64**	.65**	-	
WEMWBS	-.36**	-.33**	-.57**	-.75**	-.72**	-.47**	-

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 9*Correlations Between all Measures at Post-Intervention*

Variables	VAS-Anxiety	VAS-Stress	VAS-Depression	BDI	STAI	PSS	WEMWBS
VAS-Anxiety	-						
VAS-Stress	.79**	-					
VAS-Depression	.59**	.67**	-				
BDI	.40**	.43**	.58**	-			
STAI	.46**	.34**	.39**	.45**	-		
PSS	.19	.26*	.23*	.36*	.17	-	
WEMWBS	-.27*	-.34**	-.45**	-.64**	-.56**	-.28**	-

* $p < .05$, ** $p < .01$, *** $p < .00$

4.3.2 Preliminary Analyses

Participants in the CAI groups were randomly allocated to interact with either Elvis or Dahlia. Initial analyses included canine (Elvis vs Dahlia) as an independent variable, however there was no significant impact of canine on any of the measures, therefore it was decided to exclude this from the analysis. In addition, whether a participant lived with a canine was also factored into the analysis. Again, there were no significant differences between participants who lived with a canine and those who did not, therefore this was also excluded from reported analyses. Finally, a one-way ANOVA was performed on all pre-measure scores (VAS-Anxiety, VAS-Stress, VAS-Depression, BDI, STAI, PSS and WEMWBS) across the groups to check for pre-existing differences before participants received their intervention. No significant pre-existing differences were identified.

4.3.3 Correlation Analyses

The results of the correlation analysis indicate a significant correlation between all measures pre intervention (Table 8), and most post intervention (Table 9). Positive correlations were found pre-intervention between the VAS-Anxiety, VAS-Stress, VAS-Depression, BDI, STAI and PSS indicating that anxiety, stress, and depression measured across a breadth of measures were all highly related. In addition, a negative correlation was demonstrated between the WEBWMS and VAS-Anxiety, VAS-Stress, VAS-Depression, BDI, STAI and PSS indicating that high levels of well-being were related to low levels of anxiety, stress, and depression. Post intervention correlations differed slightly. No correlation was found between VAS-Anxiety and PSS or the STAI and PSS. All other measures were significantly correlated.

4.3.4 Anxiety

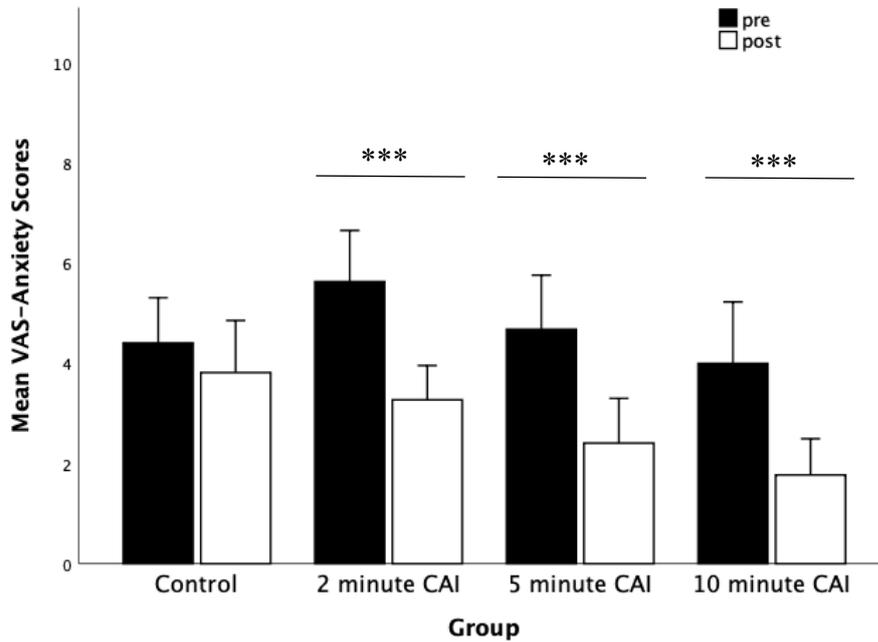
Figures 8a and 8b shows mean scores for all anxiety measures, pre and post-intervention, in the 2 minute CAI, 5 minute CAI, 10 minute CAI groups and the control group. *Figure 8a* displays the mean VAS-Anxiety scores, pre and post intervention in the 2 minute CAI, 5 minute CAI, 10 minute CAI groups and the control group. The graph shows a greater reduction in anxiety from pre to post-intervention in all three CAI groups in comparison to the control group. A 4×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 84) = 88.95, p < .001, \eta^2_p = .51$ (95% CIs [0.36, 0.62]), but no significant main effect of group, $F(3, 84) = 2.69, p = .05, \eta^2_p < .09$ (95% CIs [0, 0.19]). Critically, there was a significant phase × group interaction, $F(3, 84) = 4.63, p = .005, \eta^2_p = .14$ (95% CIs [0.02, 0.26]). To follow up the significant interaction, simple effects analyses revealed a significant difference from pre to post intervention in the 2 minute group, $F(1, 84) = 35.77, p < .001, r = .55$, the 5 minute group, $F(1, 84) = 33.07, p < .001, r = .53$, and the 10 minute group, $F(1, 84) = 31.76, p < .001, r = .52$. However, there was no significant difference from pre to post intervention in the control group, $F(1, 84) = 2.24, p = .14, r = .16$. Findings therefore indicate that CAI, as measured by the VAS, was effective in reducing anxiety compared to the control group in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups.

Figure 8b shows the mean anxiety scores as measured by the STAI indicating a reduction in anxiety levels in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups and a much smaller reduction in the control group, pre to post intervention. A 4×2 mixed ANOVA demonstrated a significant main effect of phase, $F(1, 84) = 118.71, p < .001, \eta^2_p = .59$, (95% CIs [0.45, 0.68]) but no significant main effect of group, $F(3, 84) = 2.23, p = .09, \eta^2_p = .07$, (95% CIs [0, 0.17]). The phase × group interaction was significant, $F(3, 84) = 5.95, p < .001, \eta^2_p = .18$.59, (95% CIs [0.03, 0.30]). Simple effects revealed a significant difference from pre to post intervention in the 2 minute group, $F(1, 84) = 40.48, p < .001, r = .57$, the 5 minute

group, $F(1, 84) = 50.06, p < .001, r = .61$ and the 10 minute group, $F(1, 84) = 42.70, p < .001, r = .58$. However, there was no significant difference from pre to post intervention in the control group, $F(1, 84) = 3.30, p = .07, r = .19$. In line with the results from the VAS, the STAI demonstrated a reduction in anxiety in the 2, 5 and 10 minute CAI groups in comparison to the control group.

Figure 8a

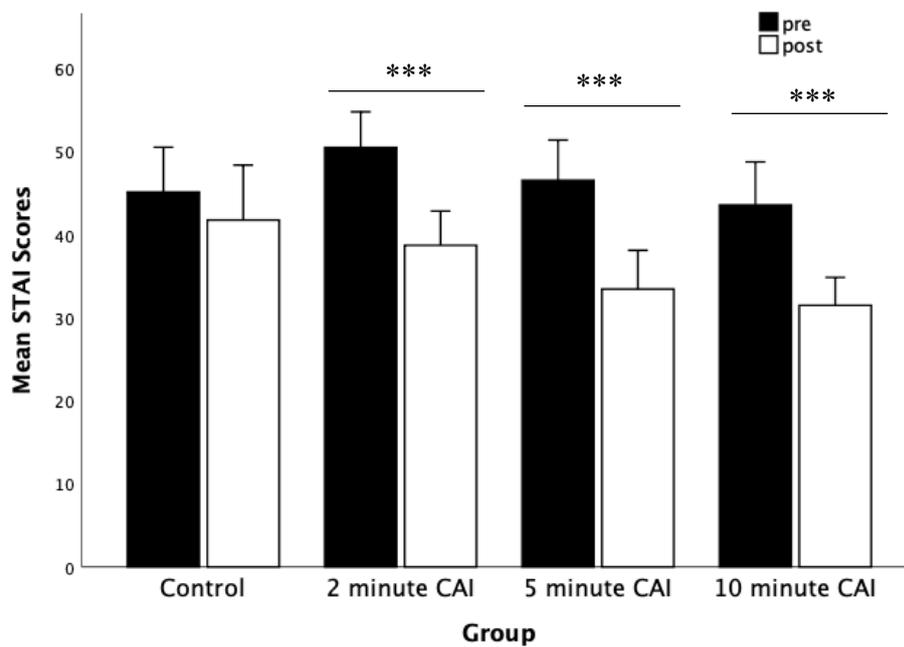
Pre and Post Mean VAS-Anxiety Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group



*p < .05, ** p < .01, *** p < .001

Figure 8b

Pre and Post Mean STAI Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group



* p < .05, ** p < .01, *** p < .001

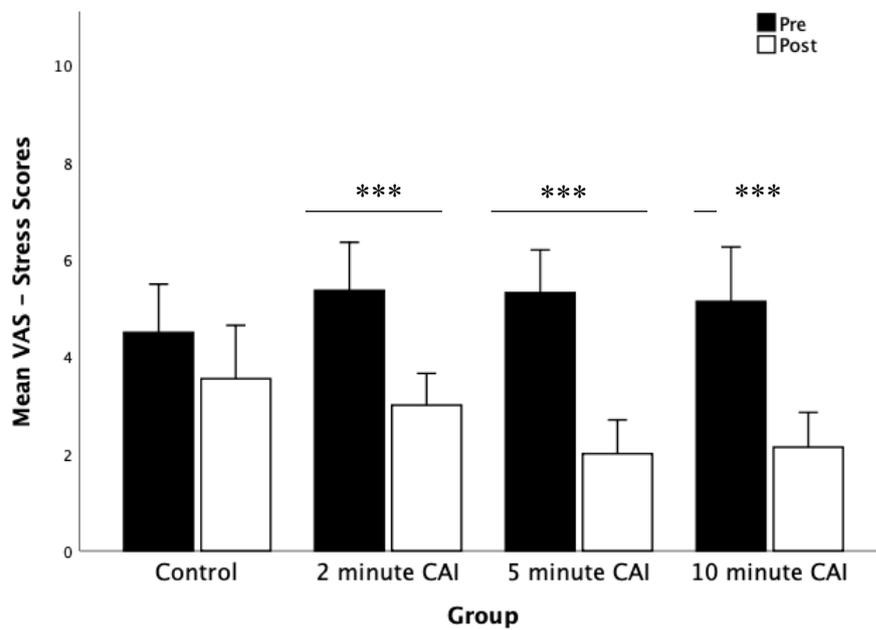
4.3.5 Stress

Figures 9a and 9b shows mean pre and post-intervention scores for all stress measures in the 2 minute CAI, 5 minute CAI, 10 minute CAI groups and the control group. Figure 9a shows the mean VAS-Stress scores demonstrating a larger reduction in stress in all CAI groups compared to the control group. A 4×2 mixed ANOVA revealed a significant main effect of phase $F(1, 84) = 132.08, p < .001, \eta^2_p = .61$ (95% CIs [0.48, 0.70]) but no significant main effect of group, $F(3, 84) = 0.49, p = .69, \eta^2_p = .02$ (95% CIs [0, 0.07]). Importantly a significant phase × group interaction, $F(3, 84) = 6.25, p < .001, \eta^2_p = .18$ (95% CIs [0.04, 0.30]) was found. To follow up the significant interaction, simple effect analyses indicated a significant difference from pre to post intervention in the 2 minute group, $F(1, 84) = 31.79, p < .001, r = .52$, the 5 minute group, $F(1, 84) = 62.64, p < .001, r = .65$, and 10 minute group, $F(1, 84) = 51.20, p < .001, r = .62$, but no significant difference from pre to post intervention in the control group, $F(1, 84) = 5.18, p = .03, r = .24$. These results indicate CAI was effective in reducing stress as measured by the VAS-Stress in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups when compared to the control group.

Figure 9b displays the PSS scores, pre and post intervention, in the 2 minute CAI, 5 minute CAI and 10 minute CAI and control group. A small reduction in stress was found in all groups including the control group. Results of the 4×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 84) = 16.05, p < .001, \eta^2_p = .16$ (95% CIs [0.04, 0.30]) but no significant main effect of group $F(3, 84) = 2.56, p = .06, \eta^2_p = .08$ (95% CIs [0, 0.13]) which indicates a reduction in stress regardless of group. In addition there was no significant phase × group interaction, $F(3, 84) = 0.96, p = .42, \eta^2_p = .03$ (95% CIs [0, 0.09]). Therefore, regardless of group, participants experienced a small reduction in stress post-interaction compared to pre-interaction, even in the control group.

Figure 9a

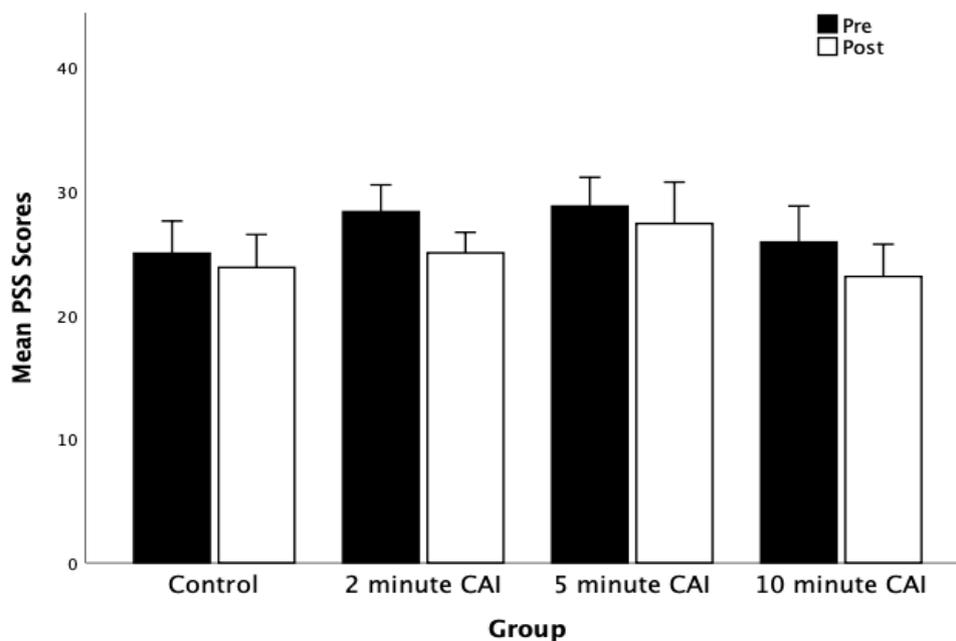
Pre and Post Mean VAS-Stress Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group



* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 9b

Pre and Post Mean PSS scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI and 10 Minute CAI and Control Group



4.3.6 Depression

Figures 10a and 10b show mean scores for all pre and post-intervention depression measures, in the 2 minute CAI, 5 minute CAI, 10 minute CAI groups and the control group. Figure 10a shows the mean VAS-Depression scores indicating a reduction in depression levels pre to post intervention in all groups, however, there is a greater reduction in the CAI groups compared to the control group. A 4×2 mixed ANOVA revealed a significant main effect of phase $F(1, 84) = 41.39, p < .001, \eta^2_p = .33$ (95% CIs [0.17, 0.46]), but no significant main effect of group, $F(3, 84) = 0.05, p = .98, \eta^2_p = .002$ (95% CIs [0, 0.19]) indicating a reduction in depression levels regardless of the group participants were in. No significant phase × group interaction $F(3,84) = 1.53, p = .21, \eta^2_p = .05$ (95% CIs [0, 0.14]) was seen. Therefore, regardless of group, participants experienced a reduction in depression post-intervention from pre-intervention.

Figure 10b displays the mean BDI scores. Like the VAS-Depression scores, there was a reduction in depression from pre intervention to post intervention in all groups, with a larger reduction in the CAI groups compared to the control group. A 4×2 mixed ANOVA demonstrated a significant main effect of phase, $F(1, 84) = 86.53, p < .001, \eta^2_p = .51$ (95% CIs [0.35, 0.61]) but no significant main effect of group, $F(3, 84) = 0.49, p = .69, \eta^2_p = .02$ (95% CIs [0, 0.07]). However the group × phase interaction was significant, $F(3, 84) = 3.80, p = .01, \eta^2_p = .12$ (95% CIs [0.01, 0.23]). Simple effect analyses showed a significant difference from pre to post intervention in the 2 minute group, $F(1, 84) = 23.41, p < .001, r = .47$, the 5 minute group, $F(1, 84) = 46.84, p < .001, r = .60$, and 10 minute group, $F(1, 84) = 23.03, p < .001, r = .46$, but no significant difference from pre to post intervention in the control group, $F(1, 84) = 4.51, p = .04, r = .23$. Therefore CAI was effective in reducing depression as measured by the BDI in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups but not the control group.

Figure 10a

Pre and Post Mean VAS-Depression Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group

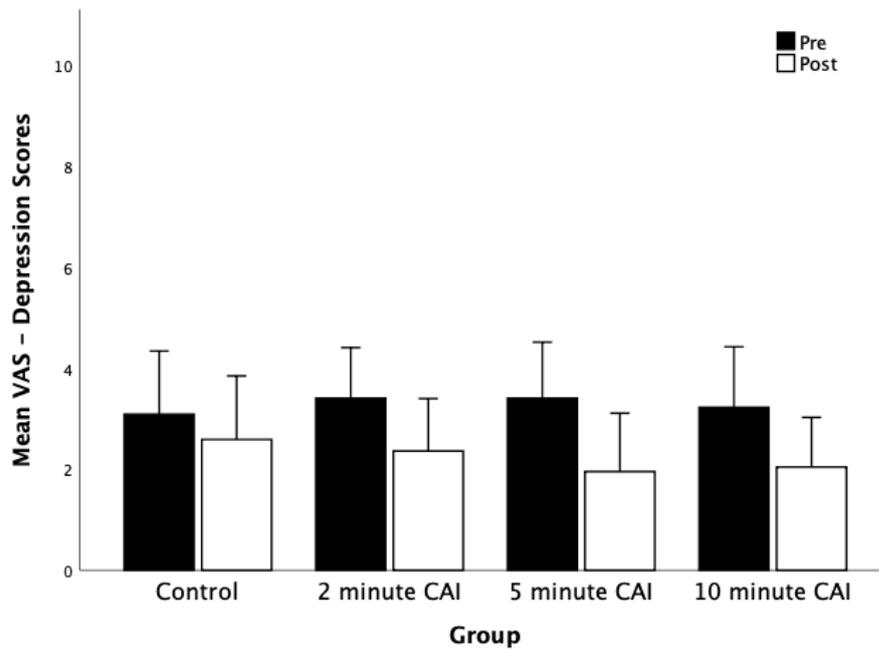
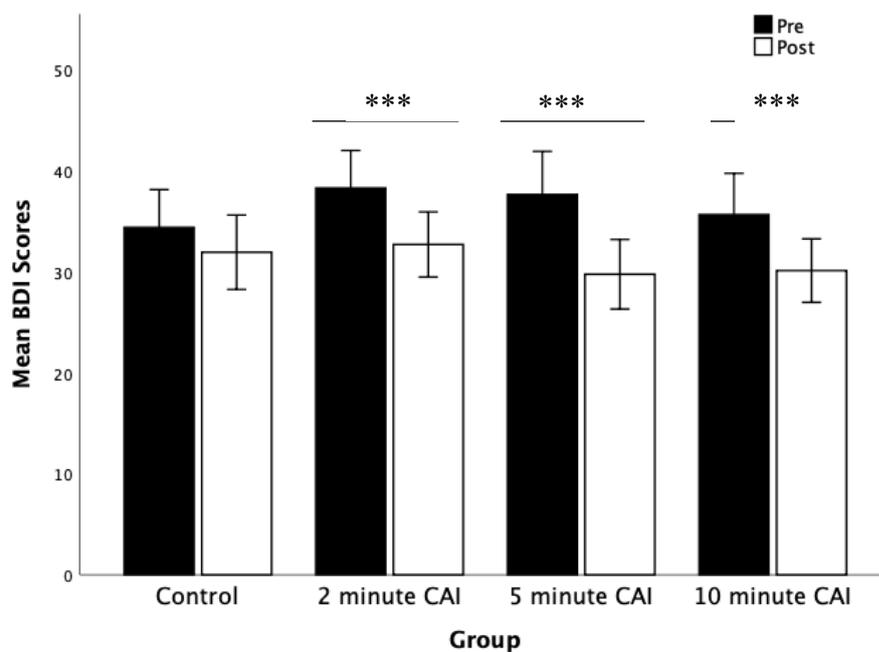


Figure 10b

Pre and Post Mean BDI Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI and 10 Minute CAI and Control Group



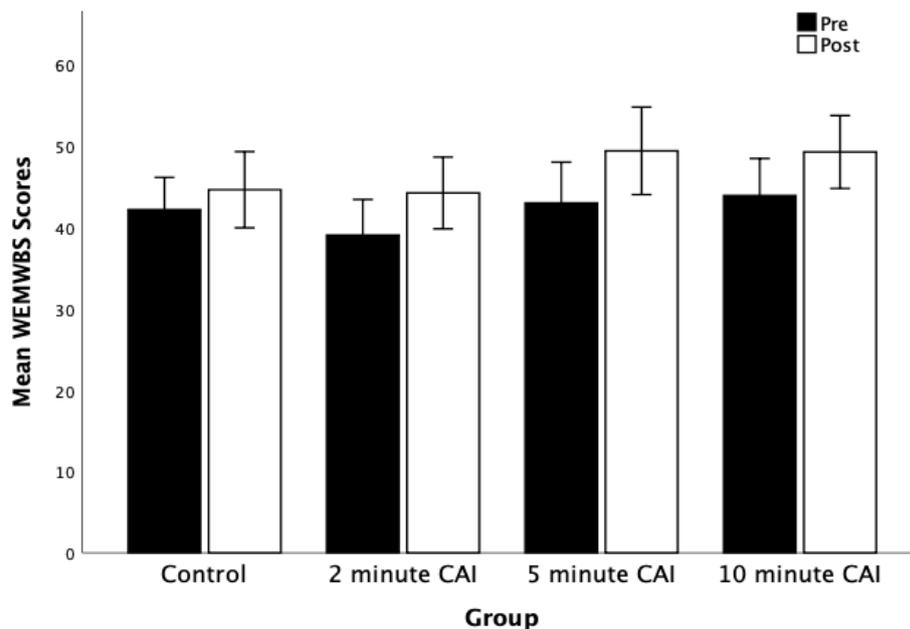
* $p < .05$, ** $p < .01$, *** $p < .001$

4.3.7 Well-Being

Figure 11 shows mean WEMWBS scores pre and post-intervention in the 2 minute CAI, 5 minute CAI, 10 minute CAI groups and the control group. Levels of well-being pre and post intervention increased by a small amount in the 2 minute CAI, 5 minute CAI and 10 minute CAI groups. There was also a slight increase in well-being in the control group. A 4×2 mixed ANOVA demonstrated a significant main effect of phase, $F(1, 84) = 50.99, p < .001, \eta^2_p = .38$ (95% CIs [0.22, 0.50]), but no significant main effect of group $F(3, 84) = 1.24, p = .30, \eta^2_p = .04$ (95% CIs [0, 0.12]) indicating there was an increase in well-being levels regardless of the groups participants were in. In addition no significant phase × group interaction, $F(3, 84) = 1.54, p = .21, \eta^2_p = .05$ (95% CIs [0, 0.14]) was found. Therefore regardless of group, participants demonstrated an increase in well-being post-interaction compared to pre-interaction.

Figure 11

Pre and Post Mean WEMWBS Scores (with SE bars) in the 2 Minute CAI, 5 Minute CAI, 10 Minute CAI and Control Group



4.3.8 Interaction Style

Using the enter method, a two stage hierarchical regression was carried out to explore whether pre measures and the five interaction activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were significant predictors of post measures. The equations for all measures resulted in high VIF scores in the interaction activities especially in pet no vocal (VAS-Anxiety, *Tolerance* < .001, *VIF* = 3674.56; STAI, *Tolerance* < .001, *VIF* = 4218.39; VAS-Stress, *Tolerance* < .001, *VIF* = 3705.22; PSS, *Tolerance* < .001, *VIF* = 3932.23; VAS-Depression, *Tolerance* < .001, *VIF* = 3782.92; BDI, *Tolerance* < .001, *VIF* = 3976.3; WEBWBS, *Tolerance* < .001, *VIF* = 3828.78). These results indicated concerns over multicollinearity. Based on this, pet no vocal was removed from model 2 in all measures resulting in acceptable VIF scores greater than 1.

Anxiety. At the first step of the regression to predict post anxiety, pre anxiety was entered resulting in pre-anxiety making a significant unique contribution to model 1, $F(1,64) = 80.80, p = < .001$ and explained 56% of variance in post anxiety. After the five intervention activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2, the total variance explained by the model as a whole was 56%, $F(5,60), = 15.50, p = < .001$. The introduction of the five intervention activities explained an additional 0% of variance in post anxiety. After controlling for pre anxiety, this change in R^2 was not significant $F(4,60) = 0.20, p = .94$. These results indicate that the five interaction activities (model 2) did not significantly predict post VAS-Anxiety.

Following the hierarchical regression used in in VAS Anxiety, pre STAI was entered into model 1 to identify if this was a predictor of post STAI. Pre STAI made a significant unique contribution the model, $F(1,64) = 46.52, p = .001$ explaining 42% of variance in post STAI. The five intervention activities (watching only, pet no vocal, pet with vocal, play toy

no vocal, and play toy with vocal) were entered into model 2, and the total variance explained by the model as a whole was 47%, $F(5,60) = 10.60$, $p < .001$. After controlling for pre STAI the change in R^2 was not significant $F(4,60) = 1.36$, $p = .26$. Based on these results, it is concluded that none of the five interaction activities (model 2) were significant predictors of post STAI.

Stress. A hierarchical regression was also used to predict post VAS-Stress. In the first stage of the regression, pre VAS-Stress was entered into model 1. The results found pre VAS-Stress had a significant unique contribution to the model $F(1,64) = 33.22$, $p < .001$ explaining 34% of variance in post VAS-Stress. After the five interaction activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2 the total variance explained by the model as a whole was 35%, $F(5,60) = 6.46$, $p < .001$. Having controlled for pre VAS-Stress, the change in R^2 was not significant $F(4,60) = .19$, $p = .94$. In summary, the five interaction activities (model 2) were not significant predictors of post VAS-Stress.

The PSS found similar results to the VAS-Stress. Pre PSS was entered into the first stage of the regression (model 1). It was concluded that pre PSS had a significant unique contribution to the model $F(1,64) = 31.56$, $p < .001$ explaining 33% of variance in post PSS. After the five intervention activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2, the total variance explained by the model as a whole was 37%, $F(5,60) = 7.03$, $p < .001$. The introduction of the five intervention activities explained an additional 4% of variance in post PSS. Controlling for pre PSS found no significant change in R^2 , $F(4,60) = 0.93$, $p = .45$. These results indicate that the interaction activities (model 2) were not significant predictors of post VAS-PSS

Depression. A two stage regression was used to explore whether pre VAS-Depression predicted post VAS-Depression. In model 1 pre VAS-Depression was entered resulting in pre VAS-Depression making a significant unique contribution to model 1 $F(1,64) = 97.06, p = < .001$ explaining 60% of variance in post VAS-Depression. After the five intervention activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2, the total variance explained by the model as a whole was 61%, $F(5,60), = 18.70, p = < .001$. The introduction of the five intervention activities explained an additional 1% of variance in post VAS-Depression. After controlling for pre depression, this change in R^2 was not significant $F(4,60) = 0.25, p = .91$. These results indicate that the five interaction activities (model 2) did not significant predictors of post VAS-Depression.

Following VAS-Depression, pre BDI was entered into model 1 to identify if this was a predictor of post BDI. Pre BDI made a significant unique contribution the model $F(1,64) = 155.98, p = .001$ explaining 71% of variance in post BDI. The five intervention activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2, and the total variance explained by the model as a whole was 72%, $F(5,60) = 30.34, p = < .001$. After controlling for pre BDI the change in R^2 was not significant $F(4,60), = 0.40, p = .81$. Based on these results, it is concluded that none of the five interaction activities (model 2) were significant predictors of post BDI.

Well-being. The final regression examined whether pre WEMWBS was a predictor of post WEMWBS. Pre WEMWBS was entered into the first stage of the regression (model 1). It was concluded that pre WEMWBS had a significant unique contribution to the model $F(1,64) = 138.95, p = < .001$ explaining 69% of variance in post WEMWBS. After the five intervention activities (watching only, pet no vocal, pet with vocal, play toy no vocal, and play toy with vocal) were entered into model 2, the total variance explained by the model as a whole

was 72%, $F(5,60) = 31.18$, $p = < .001$. The introduction of the five intervention activities explained an additional 4% of variance in post WEMWBS. Controlling for pre WEMWBS found no significant change in R^2 , $F(4,60) = 2.02$, $p = .10$. These results indicate that the interaction activities (model 2) were not significant predictors of post WEMWBS.

The overall findings indicate that while pre scores (anxiety, stress, depression, and well-being) predicted corresponding post scores, the five interaction activities (watching only, pet with vocal, play toy no vocal, and play toy with vocal) were not predictors of post anxiety, stress, or depression scores. It was concluded that the interaction activities between human and canine resulted in no positive impact on the effectiveness of CAI.

4.3.9 Canine traits

Correlation analyses were carried out using change scores (post-intervention measures minus pre-intervention measures) to explore whether there was a relationship between measures of anxiety, stress, depression and well-being, and the canine traits (Table 10). There was no significant correlation between the VAS-Anxiety and any of the eight canine traits (juvenile, adult, cute, friendly, loveable, playful, good natured and cuddly). The same was true for the VAS-Depression, BDI, PSS and WEMWBS. However there was a significant negative correlation between the STAI and cuteness, $r(66) = -.26$, $p = .001$ indicating that as the cuteness of the canine increased, anxiety levels decrease. There were no other significant correlations between the canine traits and anxiety as measured by the STAI. For stress, there was a significant negative correlation between the VAS-Stress and the cuddly canine trait $r(66) = -.26$, $p < .001$ indicating that as the cuddliness of the canine increased stress levels decreased. No other significant correlations were found between the VAS-Stress and the remaining canine traits.

Table 10*Correlation Between all Measures and Canine Traits*

Variables	VAS- Anxiety	VAS- Stress	VAS- Depression	BDI	STAI	PSS	WEMWBS
CT-Cute	-.15	-.08	.09	-.21	-.26*	-.06	.02
CT-Juvenile	-.06	.05	.05	-.008	.04	-.11	.01
CT-Adult	.06	-.09	.07	-.03	-.23	.20	-.07
CT-Friendly	-.07	-.004	-.11	.03	.14	.006	-.002
CT-Lovable	.10	-.03	.06	.05	-.07	-.02	-.06
CT-Playful	-.03	-.10	-.15	-.14	-.03	-.05	.18
CT-Good Natured	-.006	.07	.04	.13	-.02	-.04	.06
CT-Cuddly	-.13	-.26*	-.05	-.09	-.22	-.07	.15

It is important to note that high mean scores were found in the cuteness of the canine (M = 9.36, SD = 1.15), and the friendliness (M = 9.09, SD = 1.34), lovable (M = 9.36, SD = 1.52), and how good natured they appeared (M = 9.38, SD = 1.13). In addition, the cuddliness of the canine (M = 8.36, SD = 2.02) and the playfulness of the canine (M = 7.71, SD = 2.31) were found to be moderately high. These results indicate the VAS as an instrument to measure canine traits may not be sensitive enough to detect whether canine traits have an impact or that a saturation has been reached, thus ceiling effects are an issue.

4.4 Discussion

Study 1 (Chapter 3) used a RCT to determine whether CAI had an impact on the mental health of HE students, specifically their anxiety, stress, depression and well-being levels. In doing so, the study demonstrated that CAI was a suitable short term intervention that had a positive impact on anxiety and stress levels. This study, study 2, aimed to replicate the use of a RCT to examine the effectiveness of CAI by specifically exploring the influence of the length of time participants spent interacting with a canine. The main aim was therefore to identify

whether the duration of CAI influences the effects of the intervention on the mental health of HE students.

In line with previous studies that demonstrate the benefits of CAI on the mental health of HE students (e.g., Buttelmann & Röpcke, 2013; Crossman et al., 2015; Daltry & Mehr, 2015; Dell et al., 2015; Shearer et al., 2016), the results of this study show a benefit of CAI on the mental health of HE students. Specifically (1) there were no difference of duration in the effectiveness of reducing anxiety, stress, and depression, (2) the individual intervention activities during CAI did not predict a reduction in anxiety, stress, depression, or an increase in general well-being, (3) a negative correlation was found between the cuteness of the canine and anxiety, and (4) there was a negative correlation between the cuddliness of the canine and stress levels. In addition, this is the first study to challenge limitations of previous work by comparing a range of CAI session lengths alongside a control group, to identify the optimum length of a CAI session.

The most important findings in this study show that CAI has a positive impact on anxiety (as measured by the VAS-Anxiety and STAI), stress (as measured by the VAS-Stress) and depression (as measured by the BDI) levels in the 2, 5 and 10 minute CAI groups, that was not seen in the control group. These results replicate those of study 1 that also found an impact of CAI on anxiety and stress levels. The results also extend those of study 1 by demonstrating an impact of CAI on depression levels as measured by the BDI. Not only does this finding extend beyond the results of the previous study, but also previous research that found no significant effect of CAI on depression (Hall, 2018; Shearer et al., 2016). That depression was found to decrease as a result of CAI based on one depression measure (BDI) and not another (VAS) may be related to the measures themselves. The BDI is a well-established standardised measure consisting of 21 questions that has an abundance of research to support its effective use in measuring depression (Beck, et al., 1996; Ediz, et al., 2017; Hart, et al., 2018; Sakellari,

2020; Shearer et al., 2016). In comparison, the VAS is a one measure scale that asks participants to indicate their depression levels at one moment in time therefore it may be that the BDI is a more reliable tool when measuring depression levels in HE students. Further research should investigate a range of depression measures to better understand this.

That there is no difference between groups is a significant finding. If students experienced no difference in benefit from both a 2 and 10 minute CAI session, it means a greater number of students can take advantage of 2 minute CAI session within a set time period (e.g., an hour) in comparison to taking part in CAI for 5 or 10 minutes. This has a positive impact on both financial and physical resources and may be the key to make CAI a more attractive form of support to universities.

That there was no effect of CAI on general well-being supports the results from study 1 which also failed to find an overall effect of CAI on well-being. The current study used an alternative measure of well-being (the WEMWBS rather than the Ryff scales of Psychological Well-Being as used in Study 1) and still found no significant improvement in well-being following CAI. It may be that the WEMWBS, like the Ryff, was not sensitive enough to identify differences of well-being as a result of CAI. It is also possible that well-being as an undefined and general term for mood, lacks in specify and definition thus making it difficult to measure (White, 2010), or that well-being is multi-faceted, and as such CAI only impacts certain elements of this. Alternatively, CAI simply may not have an impact on well-being.

One unexpected finding in this study is that an effect of CAI was demonstrated on anxiety as measured by the VAS-Anxiety. This was not the case in study 1. It is unclear why these results differ between studies. It may be there was confusion over trait or state anxiety during data collection, however this is unlikely as the VAS asked participants to indicate their *current* anxiety levels. It is also possible there was confusion over symptoms of anxiety rather than feeling anxious. One other possibility is the number of measures/questions asked. In

study 1, a total of 139 individual questions were asked both pre, and post intervention. Study 2 only asked 68 questions. While participants were not informed of the measures used pre intervention, by the time they had received their intervention and completed post measures they may have, (in Study 1) been experiencing participant fatigue, or may have felt despondent or frustrated at the number of questions they needed to complete before they could leave. Further research is needed to understand this point.

The final aim of the current study was to explore whether particular canine traits are related to the effectiveness of CAI. If certain traits were found to have more of an influence on the effectiveness of CAI than other traits, using a canine who was for instance, cuter or more juvenile in appearance would ensure a greater impact of CAI compared to the use of a canine who was more adult looking. The results demonstrated a relationship between a reduction in anxiety and canine cuteness levels, and a reduction in stress and canine cuddliness levels. This is important as it supports the use of canines with cute and cuddly traits to be used in CAI when addressing anxiety and stress levels of HE students. As both Elvis and Dahlia are small canines they are frequently considered cute dogs, six of the eight canine traits demonstrated a moderate to high ceiling effect. Had the canines been larger dogs with less neotenous like features (e.g. Great Danes or Alsatians), this ceiling effect may not have occurred. As a result of this, interpretation of the results must be approached with the understanding that the results cannot be generalised to the application of any canine used in CAI due to the specific neotenous features of the canines these results are based on.

While the results demonstrate no differences in the effect of CAI based on the length of the session, the study is not without its limitations. One limitation is that not all facets of mental health were factored into the regression model. Due to participants numbers, only six predictors could be used. This limits the results as they do not allow for the possibility to include all mental health facets. This does not deter from the results, however having a better

understanding of what factors predict a reduction in anxiety, stress, depression, and an increase in well-being would be beneficial in order that CAI application might be more effective. A second limitation are the durations used in the study design. It could be argued that two, five and 10 minutes are all considered shorter durations. By restricting the CAI intervention duration to a maximum of 10 minutes the results are limited to 10 minutes and there is no comparison of longer durations (e.g., 20 or 40 minutes) which may have allowed for a greater reduction in domains as participants had longer to interact with the canine for.

A final limitation relates to the interaction activities and the observation of these. One unexpected finding was that none of the activities between human and canine were predictors of post intervention anxiety, stress, depression, or well-being, meaning physical interaction was not necessary for a positive impact of CAI. One potential explanation for this may be that the effectiveness of CAI is not reliant on the type of interaction with a canine. Another possible explanation is that the interactions observed were too similar (e.g., playing with the canine with a toy and playing with the canine with a toy while talking to the canine). It is also possible it was difficult to measure a difference between interactions as participants were allowed to interact naturally with the canine rather than rigidly or formally moving from one interaction activity to another. As the interactions were reliant on canine compliance rather than human compliance, during all data collection sessions, at times, the canine's interaction with the human was fleeting meaning the canine ran away from the human only to turn back 1-2 seconds later. This made it complicated to determine whether a specific interaction activity had stopped and another started. Based on this, it may have been more suitable to have given explicit instructions to individual participants as to what interactions activities they could take part in.

A strength of this study is the use of an RCT design as used in study 1, as it overcomes some of the issues (e.g., lack of control group and pre-intervention measures, external influence during data collection) found in the studies reviewed as part of the systematic review (see

Chapter 1). In addition, the finding that no difference in the effect of reducing anxiety, stress and depression was found between the 2 minute, 5 minute or 10 minute CAI session has both significant practical and financial implications. Demonstrating that CAI with a short duration (2 minutes) is as effective as a longer duration (10 minutes) has a positive impact on cost and resources as more students can take advantage of CAI in the same time period (e.g., 1 hour). This may motivate universities to use CAI alongside more traditional forms of support and motivate students to take part as it is quick and can be fitted in between classes or on a lunch break.

The present study replicates the RCT design of study 1 and supports the findings that CAI has a positive impact on anxiety and stress. In addition this study also demonstrated reductions in depression following CAI. It was also found that there is no difference in the impact of CAI in durations of 2, 5 or 10 minutes on the mental health of HE students, and that intervention activities between human and canine do not predict CAI effectiveness. Regardless of whether students choose to spend short or longer lengths of time with a canine, and regardless of the intervention activity they prefer, they will still benefit from a positive impact of CAI.

Importantly, these results are based on participants taking part in CAI individually and demonstrate that a 2 minute CAI session is as effective as a longer 10 minute CAI session, meaning more sessions can be offered in a set period (e.g. 1 hour). Having demonstrated an individual 2 minute CAI session is effective in reducing the mental health of HE students, the focus of the next chapter and main aim of study 3 is to determine whether the social environment of a grouped CAI session might impact the benefit of CAI and further increase the effectiveness of CAI.

Chapter 5

Study 3

Grouped Canine Assisted Intervention No More Effective Than Individual Participation: An Exploration of Canine Assisted Intervention Participation on Higher Education Student Mental Health

Study 2 (Chapter 4) explored how long a single CAI intervention must last in order to be effective, determining a 2 minute CAI session to be as effective as 10 minutes. It also addressed the issue of intervention duration as outlined in the systematic review (Chapter 1). Study 3 continues to address some of the issues found in the systematic review (Chapter 1). Similar to the lack of specificity in CAI duration, no studies reviewed in the systematic review directly compared different social environments of a CAI setting. Although there were a number of studies carried out with a HE population that explored the benefit of CAI on mental health while taking part in groups (e.g. Binfet et al., 2018; Binfet & Passmore, 2016, [groups of three or four students]; Dell et al., 2015, [no group numbers given]; Stewart et al., 2014, [groups of 10-15]; Trammell, 2017 [no group numbers given]; Wood et al., 2018 [groups of 6]), there are no studies that explore a direct comparison of CAI on a range of group numbers.

In Binfet and Passmore's study (2016), participants were randomly assigned to either the canine or the no treatment control group. In small groups of three or four the canine group took part in weekly sessions with a canine over an eight week period. The no treatment control group were instructed to carry on with their daily activities for the duration of the eight weeks. The results demonstrated that those in the canine group experienced a greater reduction in feelings of homesickness and a greater increase in satisfaction with life. Following this Binfet et al.'s (2018) study followed the same procedure using a one off canine session. Those in the canine group interacted with a canine in groups of three or four while the control group were told to carry on as usual by studying material from their own course. Binfet et al. (2018) found those in the canine group experienced a significant reduction in stress and homesickness and a significant increase in sense of school belonging when compared to the control group.

Dell et al. (2015) had participants from three universities interact with a therapy dog. This took place over a three day period, either in groups or individually and demonstrated the therapy dog offered feelings of love and support. In Stewart et al.'s (2014) study, all participants interacted with a canine in a public place on campus. These sessions took part bi-monthly over a 3 month period and the results demonstrated there was a significant decrease in self reported anxiety and feelings of loneliness post intervention.

However they are not without limitations. In Dell et al.'s (2015) study there were a number of external factors including food and hand massages during CAI that may have impacted the effects by enhancing positive feelings of the situation and canine interaction. In Stewart et al.'s (2014) study data collection took place in a crowded public area which could have affected the students experience by either enhancing or even diminishing the effect of CAI. The canines focus and behaviour may have also been affected which could have had an impact on results. Similar to Stewart et al.'s (2014) study, data collection for study 1 of Trammell's paper (2017) took place in an open plaza on campus which may have impacted the canine behaviour. More importantly the surrounding environment may have influenced the participants experience by distracting the participant from the canine, thus making it difficult to determine whether the results were a direct influence of the canine or due to an external influence. While these issues do not deter from the benefits experienced by the students, the limitations make it difficult to categorially claim the positive benefits of CAI were a direct result of interacting with the canine and not from a combination of other external influences.

One critical limitation of CAI studies that explore CAI in a group setting is that there is no comparison made between how participants experience CAI, either individually or in groups, (Adamle et al., 2009; Daltry & Mehr, 2015; McArthur & Syrnyk, 2018; Wood et al. 2018). Additionally, there is no consideration as to what the effect of taking part in a group may have on the impact of CAI. The main aim of this study is therefore to identify whether

taking part in CAI in groups influences the beneficial effects of the intervention on HE student mental health.

A second, and lesser aim of this study is to explore whether interaction style measured using the VASQ predicts the effect of being part of a group while partaking in CAI. Extensive literature has demonstrated that attachment style plays an important role in determining responses to social environments (e.g., Collings & Feeney, 2000; Fraley & Davis, 1997; Hazan & Shaver, 1987). That is, individuals with secure attachments are more likely to perceive social interactions with more positive emotions, while being comfortable depending on others. On the other hand, individuals with avoidant or anxious-ambivalent attachments are more likely to perceive social interactions negatively and are more likely to perceive others as unavailable or perceive themselves as independent from a social group. They are therefore more likely to avoid emotional intimacy (e.g., Mikulincer & Shaver, 2005). Individuals with anxious-ambivalent attachment often fear being abandoned thus may seek closer relationships while also having a guarded view of others (Feeney & Noller, 1990; Hazan & Shaver, 1987), and experience unsatisfactory relationships (Honair & Saremi, 2015). Individuals with a fearful style and a negative view of themselves and others (Ditommason et al., 2003) may be unable to achieve a feeling of connectedness during group work. Angry-dismissed and enmeshed styles are more likely to experience greater conflict in close relationships (Bifulco et al., 2002) and may struggle to support individuals in group work (angry dismissed) or may find they rely on others in the group to fulfil their needs (enmeshed). Proximity seeking may also influence how individuals contribute and influence working in groups (DeMarco & Newheiser, 2018; Rom & Mikulincer, 2003). For instance, those with an anxious attachment style may display counterproductive behaviour and feel under threat, and avoidant attachment styles may feel they know better than others leading to conflict and mistrust in groupwork.

Given that those with an angry-dismissive attachment style are generally mistrustful of others and tend to be more independent (Bifulco & Thomas, 2013), and a fearful attachment style fear rejection and have a negative view of others, the support offered, and may struggle to connect with group work/interaction; it was expected that participants with an insecure mistrustful attachment style would find interacting with a CAI alone had an impact on the domains measured. Additionally, those who are proximity seeking would find a better impact on domains when experiencing CAI in a pair or as part of a trio.

The current study therefore randomly assigned participants to one of three groups. Participants in the individual CAI group interacted with a canine on their own, participants in the paired CAI group interacted with a canine and one other participant, and those in the trio CAI group interacted with a canine and two other participants. Studies 1 and 2 (Chapters 3 and 4) followed a RCT design and determined CAI to be effective in reducing anxiety and stress and depression (Study 2 only). As both these studies used a control group it was concluded that CAI was directly responsible for the positive findings and that no other factors were involved. Thus it was decided a no interaction control group was unnecessary for this study. Based on the results of study 2 (Chapter 4), all groups interacted with a canine for 2 minutes. Previous research (Binfet & Passmore, 2016; Binfet et al., 2018) demonstrated a social environment of groups of three or four participants had a positive impact on the mental health of HE students, therefore it is hypothesised that the effect of social environment in the paired and trio CAI group will lead to a greater impact of CAI in reducing anxiety, stress, and depression, and an improvement in general well-being in HE students in comparison to the individual CAI group. However it is unclear whether the trio group will experience a greater impact of CAI in comparison to the paired group. It is also hypothesised that participants who demonstrate a proximity seeking attachment style will experience a greater impact of CAI in comparisons to those with an insecure/mistrustful/fearful or angry attachment styles. One final

point relates to participants feelings towards canines. Study 2 (Chapter 4) demonstrated the canine's cuteness had a positive influence on anxiety levels, the same was found for cuddliness on stress levels. However participants were not asked how they felt about dogs therefore this study will ask participants to rate how much they like dogs to identify whether this had an impact on CAI.

5.1 Method

5.1.1 Participants

Sixty seven participants (59 females, 8 males) were assigned to one of three groups, individual CAI, paired CAI, or trio CAI. The sample size was based on Cohen's (1988) recommended power of .80 power calculations to detect a medium effect size. Participants were recruited from Middlesex University. All participants were ungraduated students whose ages ranged between 18 years to 25 years with a mean age of 20.69 years (SD = 2.10, female M = 20.76 years, SD = 2.01, male M = 20.13 years, SD = 2.75). Four participants were excluded as they did not meet the age criteria. Of the 67 participants, 37 were of a White background, two White and Black African or Caribbean and two, White Asian mix. There were six of African, Caribbean or any other Black background, four Arab's, two Chinese, 12 from any other background and two chose not to state their ethnic background. Exclusion criteria included a fear of dogs, allergies to animals and whether the participant had ever intentionally harmed an animal. Written consent to take part in the study was collected from all participants and ethical approval was obtained by the Middlesex University Psychology Research Ethics Committee. All participants received a £5 Amazon voucher or research credits towards their course requirement if they were a Psychology Student.

5.1.2 Materials

Like studies 1 and 2, all data was collected using Qualtrics on 3 Amazon Fire HD 8 (7th Generation).

5.1.3 Canine

As study 2 found no significant impact of either canine (Elvis or Dahlia) on any of the measures, study 3 only used Dahlia (see Figure 4 in Chapter 2) for the simple reason she was easier to transport. Dahlia frequently socialises with people other than her owner and enjoys the attention. Having successfully completed obedience and reinforcement training she was with the researcher at all times and was monitored to ensure she was never in fear or distress. To safeguard both canine and participant, Dahlia did not provide CAI for more than four sessions a day. Additionally she was made accustomed to her surroundings prior to data collection commencing and to ensure she was not overworked Dahlia was given approximately 20-25 minutes rest between CAI sessions.

5.1.4 Questionnaire measures

Two standardised questionnaires were used to measure interaction style and well-being alongside three VAS which measured anxiety, stress, and depression. Five VAS were also used to measure additional elements of well-being (optimism, confidence, cheerfulness, relaxation, feeling loved). Full details of each measure can be found in the methodology (Chapter 2).

The VASQ (Bifulco et al., 2003, *Appendix N*) was used to measure participants interaction style. Internal consistency was found to be acceptable for total VASQ, Cronbach's $\alpha = .79$ and degree of proximity/distance $\alpha = .72$, and high for insecurity/mistrust, $\alpha = .83$.

The VAS (Appendix C) was applied to measure participants current anxiety, stress, and depression levels pre and post intervention. Participants were asked to indicate how they felt at that current moment in time on a 10-point scale.

Visual analogue scales - Well-being: (Appendix D) followed the VAS described above. Following the well-being results from the Ryff (Study 1) and the WEMWBS (Study 2), study 2 suggested that well-being could be multi-faceted, and as such CAI may only impact certain aspects. Based on this a simple well-being VAS was created. Taking inspiration from Rath and Harter (2010) who found well-being resulted in a combination of five specific areas (career, social, financial, physical and community) the VAS was based on five elements of well-being (optimism, confidence, cheerfulness, relaxation, feeling loved) that compliment Rath and Harter's (2010) work. Participants indicated where, on a 10 point scale best represented their feelings in relation to the five elements.

The PWI (International Wellbeing Group, 2013, Appendix M) was used as a standardised measure to assess participants well-being. Reliability was high pre-intervention, Cronbach's $a = .82$, and post-intervention $a = .87$.

5.2 Procedure

The methodology chapter (Chapter 2) outlines the general procedures followed by this study.

All data collection took place in a lab on campus at Middlesex University. Participants scheduled pre-arranged appointments through the researcher and were assigned into one of the three groups, the Individual CAI group ($n = 21$), the Paired CAI group ($n = 22$), or the Trio CAI group ($n = 24$). Participants were able to book a CAI session either on their own, with a friend/s to make groups of two or three, or they were assigned a CAI group. The total duration of the study took approximately 30 minutes. A demographics questionnaire was completed by

all participants once it was confirmed they all met the inclusion criteria and had signed a consent form. Participants were also asked whether they liked canines on a five-point scale ranging from *like dogs* to *dislike dogs*.

Pre-intervention: Measures were presented to all three groups in the same order (VASQ, VAS-Anxiety, VAS-Stress, VAS-Depression, VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation, VAS-Feeling Loved and PWI). The canine was out of sight of all participants during pre-intervention measures.

Intervention: Participants either chose to take part individually, as a pair or as a trio. If participants were unable to bring a friend they were assigned where required. All groups interacted with the canine for 2 minutes. Participants in the Individual CAI group interacted on their own with the canine. Participants in the Paired CAI group interacted with the canine with one other participant, and those in the Trio CAI groups interacted with the canine with two other participants. Participants were informed the researcher would stay in the room during the session but would not take part in the intervention. CAI sessions took place in the same room with no other interactions or influences such as other persons on site. The participants dictated the level and form of interaction with the canine.

Post-intervention: All groups completed post intervention measures in the same pre-intervention order (VASQ, VAS-Anxiety, VAS-Stress, VAS-Depression, VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation, VAS-Feeling Loved and PWI). All participants were fully debriefed once post-measures had been completed. Finally, participants were given the opportunity to ask the researcher any questions about the study or the canine.

5.3 Results

5.3.1 Statistical Analysis

Correlation analyses were first conducted to check concordance between measures pre-intervention (Table 11) and post-intervention (Table 12). In order to explore whether the social environment had an influence on the mental health and well-being outcomes of CAI in the individual CAI group, the paired CAI group and the trio CAI group, two-way 3(group: individual CAI group, paired CAI group, trio CAI group) \times 2(phase: pre vs post) mixed ANOVAs (between groups on the group variable and within subjects on the phase variable) were performed on anxiety, stress, depression, optimism, confidence, cheerfulness, relaxation, feeling loved, and personal well-being scores. Alpha = 0.05 was set as the rejection criterion in all analyses, the effect size is reported as partial eta-squared (η^2_p).

To explore the relationship between CAI and interaction style, a hierarchal regression was carried out to explore whether pre VAS-Anxiety (model 1) and VASQ Insecurity/Mistrust and VASQ Degree Proximity Seeking (model 2) were significant predictors of anxiety, stress, depression, and general well-being. This hierarchal regression was repeated on all other VAS measures, (stress, depression, optimism, confidence, cheerfulness, relaxation, feeling loved) and the PWI.

Table 11*Correlation Between all Measures at Pre-Intervention*

Variables	VAS- Anxiety	VAS- Stress	VAS- Depression	VAS - Optimism	VAS - Confidence	VAS - Cheerfulness	VAS - Relaxation	VAS - Feeling Loved	PWI
VAS- Anxiety	-								
VAS- Stress	.81**	-							
VAS- Depression	.66**	.69**	-						
VAS - Optimism	-.23	-.24	-.38**	-					
VAS - Confidence	-.27*	-.23	-.22	.51**	-				
VAS - Cheerfulness	-.27*	-.30*	-.40**	.55**	.54**	-			
VAS - Relaxation	-.33**	-.45**	-.37**	.50**	.64**	.59**	-		
VAS - Feeling Loved	.03	-.16	-.26*	.45**	.26*	.35**	.42**	-	
PWI	-.33**	-.25*	-.42**	.31*	.43**	.38**	.50**	.41**	-

* p < .05, ** p < .01, *** p < .001

Table 12*Correlation Between all Measures at Post-Intervention*

Variables	VAS- Anxiety	VAS- Stress	VAS- Depression	VAS - Optimism	VAS - Confidence	VAS - Cheerfulness	VAS - Relaxation	VAS - Feeling Loved	PWI
VAS- Anxiety	-								
VAS- Stress	.82**	-							
VAS- Depression	.66**	.53**	-						
VAS - Optimism	-.17	-.13	-.14	-					
VAS - Confidence	-.29*	-.35**	-.18	.39**	-				
VAS - Cheerfulness	-.17	-.28*	-.14	.59**	.63**	-			
VAS - Relaxation	-.30*	-.38**	-.18	.38**	.67**	.74**	-		
VAS - Feeling Loved	-.23	-.23	-.20	.45**	.35*	.55**	.48**	-	
PWI	-.39*	-.32**	-.37**	.33**	.47**	.40**	.57**	.41**	-

* p < .05, ** p < .01, *** p < .001

5.3.2 Preliminary Analysis

To explore whether participants feelings towards canines had an impact on CAI, participants were asked if they liked dogs. A one-way ANOVA was performed on all group and the results found no significant difference between groups as demonstrated by a one-way ANOVA $F(2,62) = 1.82, p = .17$.

5.3.3 Pre-existing differences

A one-way ANOVA was carried out on all pre-measure scores (VAS-Anxiety, VAS-Stress, VAS-Depression, VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation, VAS-Feeling Loved, and the PWI) to check for any pre-existing differences before the intervention. No significant pre-existing differences were found.

5.3.4 Correlation Analyses

A series of correlations were carried out pre-intervention (Table 11) and post-intervention (Table 12), demonstrating the majority of the measures were correlated. Positive correlations were found pre-intervention between the VAS-Anxiety, VAS-Stress, VAS-Depression, and between VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation, VAS-Feeling Loved and PWI. A negative correlation was found between VAS-Anxiety, VAS-Stress, VAS-Depression and VAS-Cheerfulness and VAS-Relaxation and PWI, between VAS-Anxiety and VAS-Confidence, and between VAS-Depression and VAS-Optimism and VAS-Feeling Loved indicating that anxiety, stress and depression, optimism, cheerfulness, relaxation, and well-being were all highly related.

Post intervention, a positive correlation was also found between the VAS-Anxiety, VAS-Stress, VAS-Depression, a negative correlation found between the VAS-Anxiety and VAS-Confidence, VAS-Relaxation and PWI, between VAS-Stress, VAS-Confidence, VAS-

Cheerfulness, VAS- Relaxation and PWI and between VAS-Depression and PWI. In addition, a positive correlation was found between VAS-Optimism and VAS-Confidence, VAS-Cheerfulness and VAS-Relaxation, VAS-Feeling Loved and PWI, between VAS-Confidence and VAS-Cheerfulness and VAS-Relaxation, VAS-Feeling Loved and PWI, between VAS-Cheerfulness and VAS-Relaxation, VAS-Feeling Loved and PWI, VAS-Relaxation and between VAS-Feeling Loved and PWI and between VAS-Feeling Loved and PWI.

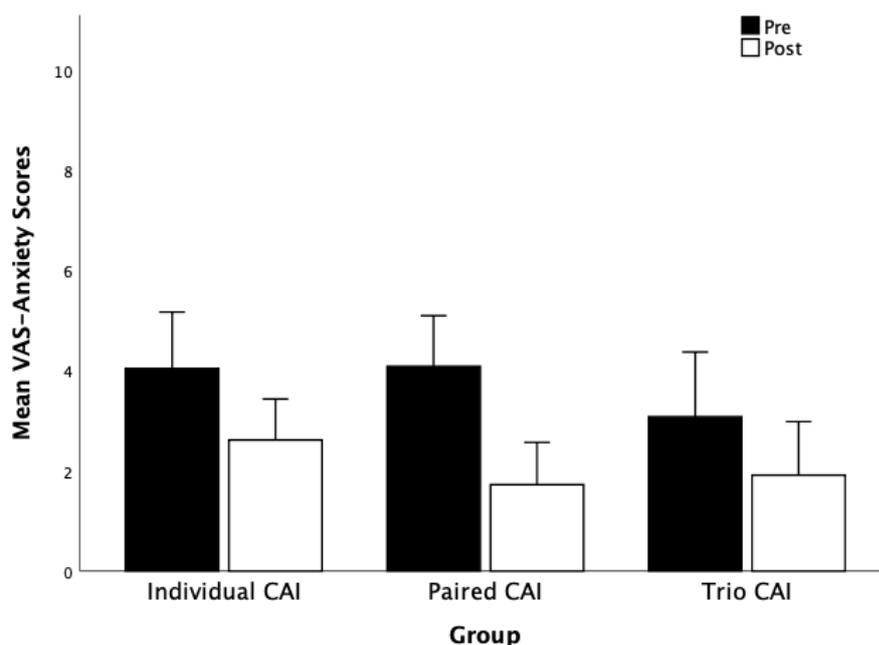
A negative correlation was found between VAS-Stress and VAS-Confidence, VAS-Cheerfulness and VAS-Relaxation and the PWI, and between the VAS-Depression and PWI. Interestingly there was a no correlation between VAS-Feeling loved and VAS-Optimism and the VAS Anxiety, Stress and Depression. Additionally there was also no correlation between the VAS-Depression and the VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation or VAS-Feeling Loved. These results indicate that the main three domains, anxiety, stress and depression were not well correlated with elements of well-being as pre measures.

5.3.5 Anxiety

Figure 12 displays the mean VAS-Anxiety scores, pre and post intervention in the individual CAI, paired CAI and trio CAI groups. Figure 12 shows a reduction in anxiety from pre intervention to post intervention in all three groups with the greatest reduction in the paired group. A 3×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 64) = 43.65, p < .001, \eta^2_p = .41$ (95% CIs [0.22, 0.54]), indicating a significant reduction in anxiety following CAI regardless of group. However, there was no significant main effect of group, $F(2, 64) = 0.83, p = .44, \eta^2_p < .03$ (95% CIs [0.00, 0.12]), indicating anxiety levels were lowered regardless of group. In addition there was no significant phase × group interaction, $F(2, 64) = 2.13, p = .13, \eta^2_p = .06$ (95% CIs [0.00, .018]). Results therefore demonstrate that CAI was effective in reducing anxiety from pre to post intervention, regardless of whether participants took part in CAI as an individual, in a pair or in a trio.

Figure 12

Pre and Post Mean VAS-Anxiety Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group

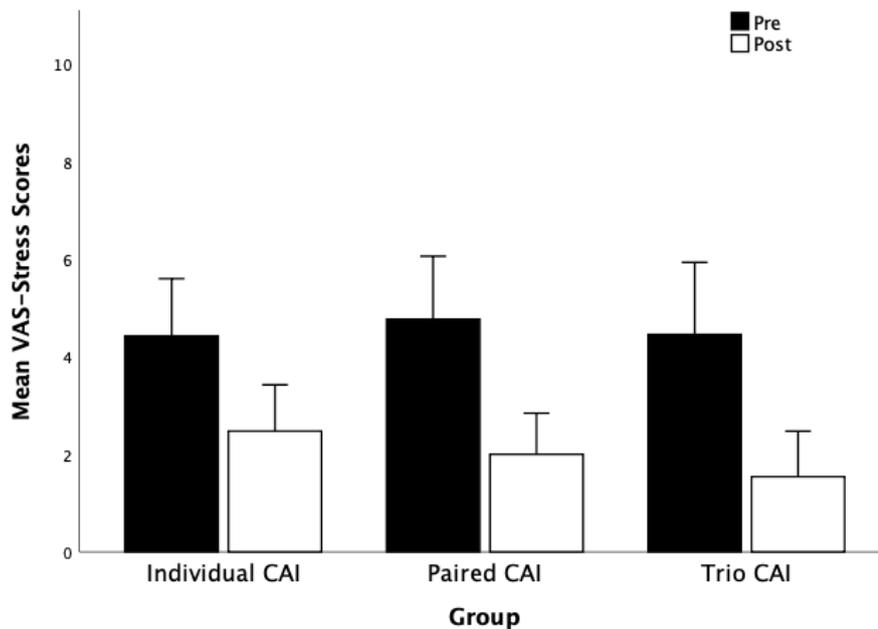


5.3.6 Stress

Figure 13 shows a reduction in VAS-Stress scores in all three groups from pre to post-intervention with the largest reduction in the trio group. A 3×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 64) = 56.53, p < .001, \eta^2_p = .47$ (95% CIs [0.29, 0.60]). There was no significant main effect of group, $F(2, 64) = 0.28, p = .76, \eta^2_p < .009$ (95% CIs [0.00, 0.07]) indicating that regardless of group, stress levels were significantly reduced. Finally, no significant phase × group interaction, $F(2, 64) = 0.77, p = .47, \eta^2_p = .02$ (95% CIs [0.00, 0.11]) was found. Therefore similar to the results of the VAS-Anxiety, regardless of how participants experienced CAI (individually, in pairs, or in a trio), CAI reduced stress levels from pre to post intervention.

Figure 13

Pre and Post Mean VAS-Stress Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group

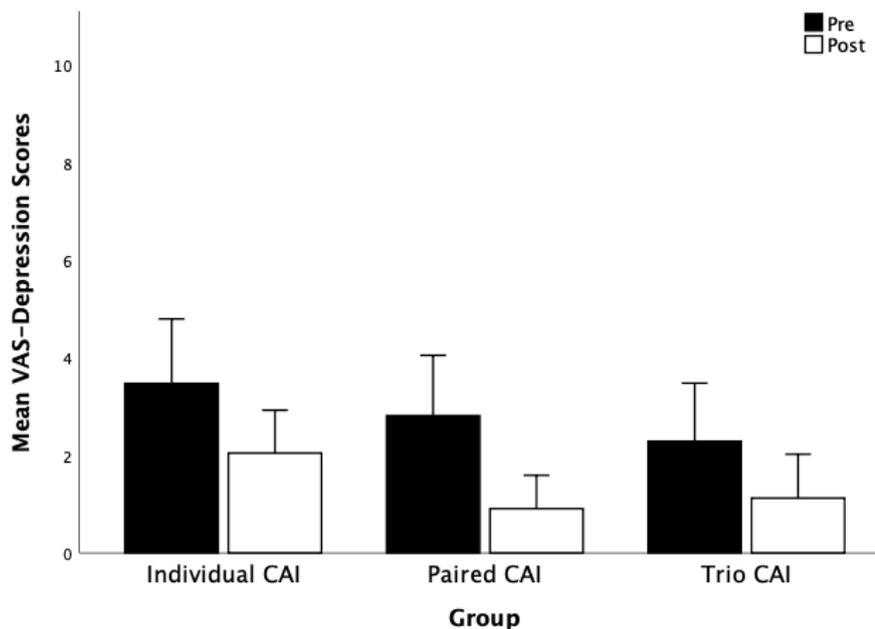


5.3.7 Depression

VAS-Depression scores are shown in *Figure 14*. All three groups experienced a reduction in depression with a greater reduction in the paired and trio groups. The 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 41.85, p < .001, \eta^2_p = .40$ (95% CIs [0.21, 0.53]), but no significant main effect of group, $F(2, 64) = 1.43, p = .25, \eta^2_p = .04$ (95% CIs [0.00, 0.15]) indicating a reduction in depression regardless of group. In addition there was no significant phase × group interaction $F(2,64) = 0.90, p = .41, \eta^2_p = .03$ (95% CIs [0.00, .012]). In line with both the VAS-Anxiety and VAS-Stress results, the findings demonstrate depression levels were reduced post intervention, regardless of whether participants experienced CAI individually, in a pair or in a trio.

Figure 14

Pre and Post Mean VAS-Depression Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group



5.3.8 Visual Analogues Scales - Well-being

Optimism. *Table 13* shows pre and post-intervention mean scores for the three groups indicating an increase in optimism pre to post intervention in all three groups with the greatest increase in the paired and trip group. A 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 31.51, p < .001, \eta^2_p = .33$ (95% CIs [0.15, 0.48]), showing an increase in optimism regardless of CAI group]. There was no significant main effect of group, $F(2, 64) = 1.49, p = .23, \eta^2_p = .05$ (95% CIs [0.00, 0.15]) and no significant phase × group interaction $F(2,64) = 0.06, p = .94, \eta^2_p = .002$ (90% CIs [0.00, 0.04]). Results show that regardless of group (individual CAI, paired CAI, or trio CAI) there was an increase in optimism from pre to post intervention.

Table 13

Pre and Post-Intervention Mean Scores and SD for the Individual CAI Group, the Paired CAI Group and the Trio CAI Group for the VAS-Optimism, VAS-Confidence, VAS-Cheerfulness, VAS-Relaxation and VAS-Feeling Loved

VAS-Optimism		<i>M</i>	<i>SD</i>
Individual CAI group	Pre	4.71	2.26
	Post	6.19	1.75
Paired CAI group	Pre	5.73	2.68
	Post	7.41	2.06
Trio CAI group	Pre	5.13	2.47
	Post	6.83	3.02
VAS-Confidence		<i>M</i>	<i>SD</i>
Individual CAI group	Pre	4.24	2.26
	Post	5.52	1.75
Paired CAI group	Pre	6.00	2.60
	Post	6.95	2.50
Trio CAI group	Pre	5.46	2.87
	Post	6.96	3.07
VAS-Cheerfulness		<i>M</i>	<i>SD</i>
Individual CAI group	Pre	4.33	2.44
	Post	6.90	1.61
Paired CAI group	Pre	5.73	2.23
	Post	8.32	1.99
Trio CAI group	Pre	5.75	2.67
	Post	8.08	2.47
VAS-Relaxation		<i>M</i>	<i>SD</i>
Individual CAI group	Pre	3.19	1.89
	Post	5.90	2.12
Paired CAI group	Pre	4.86	2.64
	Post	7.50	2.20
Trio CAI group	Pre	4.46	3.16
	Post	7.92	2.73
VAS-Feeling Loved		<i>M</i>	<i>SD</i>
Individual CAI group	Pre	5.14	2.50
	Post	7.62	1.96
Paired CAI group	Pre	5.91	3.04
	Post	8.00	2.33
Trio CAI group	Pre	4.58	3.06
	Post	7.04	3.11

Confidence. *Table 13* displays the mean VAS-Confidence scores pre to post-intervention in all three groups showing confidence levels increase pre to post intervention in all three groups. However, whereas the greatest increase was seen in the paired and trio group in the VAS-Optimism, the greatest increase in the VAS-Confidence was found in the individual and trio groups. The 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 22.66, p < .001, \eta^2_p = .26$ (95% CIs [0.09, 0.42]) but no significant main effect of group $F(2, 64) = 2.89, p = .06, \eta^2_p = .08$ (95% CIs [0.00, 0.21]), indicating that regardless of group, confidence levels were significantly increased. The ANOVA also revealed no significant phase × group interaction $F(2,64) = 0.38, p = .68, \eta^2_p = .01$ (95% CIs [0.00, 0.09]) demonstrating CAI was effective in increasing confidence levels regardless of whether participants experienced CAI individually, in pairs or in a trio.

Cheerfulness. The increase in cheerfulness levels (see *Table 13*) differs to both the VAS-Optimism and Confidence in that the greatest increase in cheerfulness was seen in the paired and individual groups, although cheerfulness levels from pre to post intervention did increase in all groups. A 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 62.09, p < .001, \eta^2_p = .49$ (95% CIs [0.31, 0.61]) and a significant main effect of group, $F(2, 64) = 3.77, p = .03, \eta^2_p = .11$ (95% CIs [0.00, 0.24]). There was no significant phase × group interaction $F(2,64) = 0.07, p = .93, \eta^2_p = .002$ (95% CIs [0.00, 0.04]) indicating that regardless of group (individual, paired, or trio) CAI was effective at increasing levels of cheerfulness pre to post intervention.

Relaxation. *Table 13* shows the mean pre to post intervention scores for the VAS-Relaxation. Relaxation increases in all three groups however the greatest increase is seen in the trio and paired groups which is similar to those of the VAS-Confidence. A 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 74.71, p < .001, \eta^2_p = .54$ (95% CIs [0.37, 0.65]) and a significant main effect of group, $F(2, 64) = 4.38, p = .02, \eta^2_p = .12$ (95% CIs [0, 0.26]), but no significant phase × group interaction $F(2,64) = 0.62, p = .55, \eta^2_p = .02$ (95% CIs [0.00, 0.10]). The findings therefore show an increase in relaxation from pre to post intervention regardless of whether participants took part in CAI, individually, in pairs or in a trio.

Feeling Loved. *Table 13* displays the mean VAS-Feeling Loved scores in all groups from pre to post-intervention demonstrating an increase in levels of feeling loved with the greatest increase seen in the individual and trio groups. A 3×2 mixed ANOVA revealed a significant main effect of phase $F(1, 64) = 43.17, p < .001, \eta^2_p = .40$ (95% CIs [0.22, 0.54]) demonstrating a significant increase in feeling loved regardless of group. There was no significant main effect of group, $F(2, 64) = 1.42, p = .25, \eta^2_p = .04$ (95% CIs [0.00, 0.15]) and no significant phase × group interaction $F(2,64) = 0.12, p = .88, \eta^2_p = .004$ (95% CIs [0, 0.06]). Therefore regardless of whether participants experienced CAI individually, in pairs or in a trio, there was an increase in levels of feeling loved pre to post intervention.

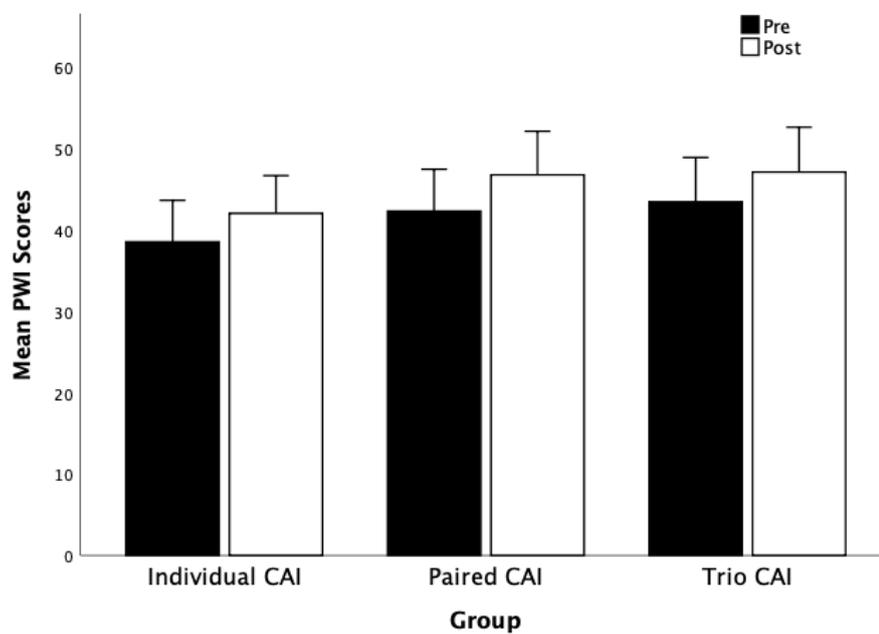
5.3.9 Personal Wellbeing Index

Figure 15 displays an increase in pre to post well-being levels in all three groups as measured by the PWI. A 3×2 mixed ANOVA revealed a significant main effect of phase, $F(1, 64) = 18.75, p < .001, \eta^2_p = .23$ (95% CIs [0.07, 0.38]). Regardless of group there was a significant increase in well-being levels from pre to post intervention. Additionally the

ANOVA demonstrated no significant main effect of group $F(2, 64) = 1.23, p = .30, \eta^2_p = .04$ (95% CIs [0.00, 0.14]), and no significant phase \times group interaction, $F(2, 64) = 0.10, p = .95, \eta^2_p = .003$ (90% CIs [0, 0.05]). Therefore there was an increase in well-being levels regardless of the how participants took part in CAI (individually, in pairs or in a trio).

Figure 15

Pre and Post Mean PWI Scores (with SE bars) Individual CAI, Paired CAI, and Trio CAI Group



5.3.10 VASQ

The enter method was used to carry out a two stage hierarchal regression to explore whether the VASQ-Insecurity/Mistrust and VSQ-Degree Proximity were significant predictors of post measures (VAS-Anxiety, Stress, Depression, Optimism, Confidence, Cheerfulness, Relaxation, Feeling Loved and PWI). Significant equations were identified in the individual and paired CAI groups but not the trio group.

Individual CAI Group.

Depression. In the first step of hierarchical regression, three predictors were entered, pre-anxiety, pre-stress and pre-depression to predict post-depression resulting in acceptable VIF scores. This model was statistically significant $F(3, 17) = 17.07, p < .001$ and explained 75% of variance in post-depression. Only pre-depression scores made a significant unique contribution to the model, pre-anxiety and pre-stress did not. After entry of VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking in model 2, the total variance explained by the model as a whole was 88%, $F(5,15) = 21.73, p < .001$. The introduction of VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking explained an additional 13% of variance in post-depression. After controlling for pre-anxiety, pre-stress and pre-depression this change in R^2 was significant $F(2,15) = 7.91, p = .005$. The final adjusted model demonstrated only VASQ Degree of Proximity Seeking was statically significant ($\beta = -.37, p = .001$) indicating that only the VASQ Degree of Proximity Seeking was a significant predictor of post-depression.

Paired CAI Group.

Confidence. A hierarchical regression was carried out for post-confidence with four predictors, pre-anxiety, pre-stress, pre-depression, and pre-confidence. The equation resulted in acceptable VIF scores. The model was statistically significant $F(4,17) = 7.67, p = .001$ and explained 64% of variance in post confidence. Only pre-confidence scores made a significant unique contribution to the model, pre-anxiety, pre-stress and pre-depression did not. VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking were entered into model 2 which increased the total variance explained by the model as a whole to 84%, $F(6,15) = 13.29, p < .001$. Introducing VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking explained an additional 20% of variance in post-confidence. After controlling for pre-anxiety, pre-stress, pre-depression and pre-confidence, results demonstrated the change in R^2 was significant $F(2,15) = 9.34, p = .002$. The final adjusted model demonstrated that both the VASQ Insecurity/Mistrust ($\beta = -.44, p = .003$) and the VASQ Degree Proximity Seeking ($\beta = -.32, p = .01$) were significant, indicating that both the VASQ Insecurity/Mistrust and VASQ Degree Proximity Seeking were significant predictors of post confidence.

Cheerfulness. Four predictors were entered to predict post cheerfulness, pre-anxiety, pre-stress, pre-depression and pre-cheerfulness with the equation presenting acceptable VIF scores. The model was not statistically significant $F(4,17) = .23, p = .92$ and explained 40% of variate in post cheerfulness. Only pre-cheerfulness scores made a significant unique contribution to the model, pre-anxiety, pre-stress and pre-depression did not. VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking were entered into model 2 increasing the total variance explained by the model as a whole to 43%, $F(6,15) = 1.61, p = .21$. Introducing VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking explained an additional 34% of variance in post cheerfulness. After controlling for pre-anxiety, pre-stress, pre-depression and pre-cheerfulness, results found the change in R^2 was significant

$F(2,15) = 4.20, p = .04$. Results of the final adjusted model demonstrated that only VASQ Insecurity/Mistrust ($\beta = -.60, p = .03$) was significant indicating that the VASQ Insecurity/Mistrust was a significant predictor of post cheerfulness.

Relaxation. A hierarchical regression was carried out for post-relaxation with four predictors, pre-anxiety, pre-stress, pre-depression, and pre-relaxation. The equation resulted in acceptable VIF scores. This model was not statistically significant $F(4,17) = 2.13, p = .12$ and explained 33% of variate in post-relaxation. Only pre-relaxation scores made a significant unique contribution to the model, pre-anxiety, pre-stress, and pre-depression did not. VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking were entered into model 2 which increased the total variance explained by the model as a whole to 65%, $F(6,15) = 4.52, p = .008$. Introducing VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking explained an additional 31% of variance in post-relaxation. After controlling for pre-anxiety, pre-stress, pre-depression and pre-relaxation, results demonstrated the change in R^2 was significant $F(2,15) = 6.56, p = .009$. The final adjusted model demonstrated that both the VASQ Insecurity/Mistrust ($\beta = -.47, p = .02$), and VASQ Degree Proximity Seeking were significant ($\beta = -.41, p = .02$). These results indicate that the VASQ Insecurity/Mistrust and VASQ Degree Proximity Seeking were significant predictors of post relaxation.

Feeling Loved. A final hierarchical regression was carried out for post-feeling loved with four predictors, pre-anxiety, pre-stress, pre-depression, and pre-feeling loved. The equation resulted in acceptable VIF scores. This model was statistically significant $F(4,17) = 7.13, p = .001$ and explained 63% of variate in post- feeling loved. Pre- feeling loved, pre-anxiety, and pre-depression scores made a significant unique contribution to the model, pre-stress did not. VASQ Insecurity/Mistrust and VASQ Degree of Proximity Seeking were entered into model 2 which increased the total variance explained by the model as a whole to 75%, $F(6,15) = 7.61, p = .001$. Introducing VASQ Insecurity/Mistrust and VASQ Degree of

Proximity Seeking explained an additional 13% of variance in post- feeling loved. After controlling for pre-anxiety, pre-stress, pre-depression and pre-feeling loved, results demonstrated the change in R^2 was significant $F(2,15) = 3.82, p = .05$. The final adjusted model demonstrated that only the VASQ Insecurity/Mistrust was significant ($\beta = -.42, p = .02$) indicating that the VASQ Insecurity/Mistrust was a significant predictor of post feeling loved.

The overall findings indicates that (1) the VASQ Degree of Proximity Seeking was a significant predictor of post-depression, however this was only in the individual CAI group. Additionally, in the paired group, (2) the VASQ Insecurity/Mistrust was a significant predictor of post cheerfulness and (3) post feeling loved, and (4) both the VASQ Insecurity/Mistrust and VASQ Degree Proximity Seeking were significant predictors of post confidence, and (5) post relaxation. All other measures demonstrated no significant regression equations

5.4 Discussion

In the previous chapter, study 2 identified no difference in the effectiveness of CAI between the 2 minute CAI group, the 5 minute CAI group or the 10 minute CAI group. These results were important as they signify that a brief CAI session is as effective as a longer CAI session meaning more students can take advantage within a set time (e.g. an hour) in 2 minutes compared to 10 minutes. This study, study 3, expands study 2 by exploring whether the human to canine ratio had an impact on the effectiveness of CAI on self-reported levels of anxiety, stress, depression, and well-being in HE students.

The findings demonstrated that regardless of how participants experienced CAI (individually, as a pair, or as a trio), a short, two minute CAI was effective in reducing anxiety, stress and depression in HE students, while also increasing well-being, including feelings of optimism, confidence, cheerfulness, relaxation, and feeling loved. The findings also

demonstrated that interaction style did not predict post CAI levels of anxiety, stress, optimism, or well-being, nor did it predict any post levels when participants took part in CAI in a trio. In those who took part in CAI individually, having a proximity seeking style predicted post depression. For those who took part in CAI in pairs, having an insecure mistrust/fearful/angry attachment style predicted post cheerfulness, and feeling loved, and finally both insecure mistrust/fearful/angry, and proximity seeking styles predicted post confidence and relaxation.

Study 3 supports both studies 1 and 2, and previous research that has shown CAI to be an effective intervention for stress, anxiety, and depression for HE students (e.g., Binfet et al, 2018; Crossman et al., 2015; Trammell, 2017) and provides further validation for the use of this intervention in HE settings. While there is an abundance of research demonstrating the benefits on the mental health of HE students receiving CAI individually (Buttelmann & Röpke, 2013; Crossman et al., 2015, Delgado et al., 2018; Fiocco & Hunse, 2017; Grajfoner et al., 2017; Hall, 2018; Jarolmen & Patel, 2018), as well as in groups (Binfet & Passmore, 2016; Crump & Derting, 2015; Daltry & Mehr, 2015; Dell et al., 2015; Shearer et al., 2016; Trammell, 2017; Wood et al., 2018), this study is the first to compare individual CAI to group CAI revealing that these mental health and well-being benefits were evident whether individuals participated in the CAI alone, in a pair or in a group of three, with no specific advantage to any of the social environments.

One particularly interesting finding is that CAI had a positive impact on depression. Study 1 found no effect on depression (due to pre-existing differences causing interpretation issues), whereas study 2 did find CAI to have an impact on depression. It may be that the introduction of experiencing CAI in a social environment had an additional positive impact on self-reported depression as additional participants add a layer of support previous studies did not incorporate. However it is far more likely that this is down to the measures used. Study 3 used a simple VAS for all measures that instructed participants to indicate on a line where they

felt their anxiety, stress, depression, and well-being levels lay. The same was true for the PWI which consists of seven questions. Compared to the DASS (Study 1), and BDI (Studies 1&2) which both asked participants to use a four point scale to answer 21 questions based on how they felt about a statement, the VAS is very simple and requires little thought. It is possible this simply intuitive gut instinct method of completing measures allowed for a more accurate measure of depression levels rather than constantly re-evaluating the question and choosing which answer of four best suits a question asked.

The finding that adding a social element to CAI through group participation has no effect on the impact of CAI goes against previous research that suggests social interaction is a direct contributing factor for successful CAI (e.g. Adamle et al., 2009; Binfet & Passmore, 2016; Binfet, 2017). Instead, it seems to be that the act of interacting with a canine is the key factor in determining the effectiveness of CAI, not the social interaction with other humans during the intervention. Although there was an increase in all five elements of well-being, it is interesting that there was a significant increase in cheerfulness and relaxation regardless of how participants took part (individually, as a pair or trio) in comparison to the other elements of well-being (optimism, confidence, feeling loved).

Another interesting finding is the results of interaction style in response to CAI. That those with a proximity seeking/enmeshed attachment style found taking part in CAI individually predicted post depression levels contradicts the belief that proximity seeking styles are generally more dependent in nature and dislike being alone. There were also conflicting results found in those who took part in pairs. As expected, proximity seeking attachment styles who experienced CAI in pairs predicted relaxation and confidence. However, for those who took part in pairs, their fearful or angry-dismissive attachment styles predicted cheerfulness and confidence which contradicts the expectation that this attachment style would respond better to experiencing CAI on their own. Finally, neither attachment styles benefitted from

taking part in CAI in groups of three which is unexpected given that proximity seeking styles were expected to benefit from CAI in a trio.

It is difficult to understand why the results do not follow what is known of attachment styles and how individual styles prefer to interact with others. This may be because the study did not first determine participant attachment styles and then allocate them to the group that would best suit them. It may also be that attachment style though effective in determining how humans behave and interact with other humans, does not have the same effectiveness when examining how humans behave or interact with canines present. One other possibility is that the theory of attachment style has no bearing on the impact of CAI in relation to anxiety, stress, depression, and well-being. However, it is far more likely that the small sample may not have provided sufficient power to allow for valid results. VIF values for the regression were also flagged as a possible issue as they were acceptable, however the VIF for all regressions did not exceed values where multicollinearity may be an issue (Field, 2005).

As with all research, this study comes with its limitations. As the study used only one canine, Dahlia, who is generally considered cute (see Figure 4) due to her size (40cm in length, 20cm height, or approximately the size of a large butternut squash), it is possible that results may be limited to smaller or cuter canines (or Dahlia herself), as seen in results from study 2 (Chapter 4) that found the cuteness of the canines had a positive impact on anxiety levels.

The second issue with the methodology is that the maximum group size in the study was a group of three participants. Previous research (e.g., Crump & Derting, 2015; Wood et al., 2018) used groups of six, while other studies (e.g., Shearer et al., 2016; Stewart et al., 2014) used groups as large as 10-15. It is possible that larger groups would have greater implications for practical and financial reasons. Following this train of thought, it is also possible larger groups may even have an impact on the effectiveness of CAI.

An additional limitation relates to participants taking part in groups with friends compared to those who interacted with the canine as part of a pair or trio. Those who participated with friends arrived with existing relationships and may have already been comfortable together in comparison to those who may have spent the first few moments introducing themselves to each other. This may have had an impact on CAI and how this was received and experienced. However due to the nature of recruitment, asking participants to book with a friend was a favourable way to secure participants.

One strength of this study is the finding that there is no difference whether participants took part in CAI individually, in a pair or as a trio on anxiety, stress, depression or well-being levels. This follows the main finding in study 2 which determined there was no difference in the reduction of anxiety, stress or depression between the 2 minute CAI group, the 5 minute CAI group, or the 10 minute CAI group. Based on this, more students can take advantage of CAI in a set time period which has significant implications for costs and resources. This will hopefully make CAI more appealing to universities as a less traditional form of support.

This study used a between subject design comparing the impact of CAI on participants who took part individually, in a pair, or as part of a trio. The results support the findings of study 1 in that CAI had a positive impact on anxiety and stress and also study 2 which found CAI also had a positive impact on depression. In addition this study demonstrates that there is no impact of a social environment on the benefits of CAI on the mental health of HE students, specifically on anxiety, stress, depression and well-being. These results help to elevate CAI as a valid support system for universities to support HE students experiencing anxiety, stress, and depression, while also improving their levels of well-being.

Chapter 6

General Discussion

General Discussion

6.1 Overview of the aims

The last decade has seen an increase in not only the number of students suffering from mental health issues during their time in HE (Binfet & Passmore, 2016; Binfet et al., 2018; Brown, 2016; House of Commons, 2020), but also a year on year rise in anxiety and depression (The Insight Network, 2019, 2020). The reason for this increase in mental health issues arguably falls into one of three areas, academic, financial, and transitional. These three elements exist for all students regardless of their circumstances. It may be that one has more prominence, however at some point during their time in HE, all students will experience a transitional, financial, or academic issue as they encompass the challenges of higher education (Ang & Liamputtong, 2008; Binfet & Passmore, 2016; Brown, 2016; Eisenberg et al., 2009; Richardson et al., 2015). While universities in the UK offer traditional forms of support to all students (Hunt & Eisenberg, 2009; Rückert, 2015; The Open University, 2020/2021), there are reports of an increase in the need for counselling, and a lack of mental health strategies in place in UK universities (Thorley, 2017). In addition, the impact that Covid-19 might have had on the mental health of HE students (Son, et al., 2020) is not yet fully understood at the time of writing. This begins to demonstrate more is needed to support students in HE who develop and experience mental health issues. Therefore, the main aim of this thesis was to explore beyond traditional forms of support available to Higher Education students to understand whether CAI has a positive effect on the mental health of these students with a specific focus on anxiety, stress, depression, and general well-being.

6.2 Summary of the findings

The summary of the three studies presents a clear image of how CAI can be used to support HE students who may have issues with their mental health during their time in HE. This will be presented by study rather than findings as each builds upon the previous study.

6.2.1 Study 1

The aim of study 1 (Chapter 3) was to explore whether the application of CAI had a significant benefit on the mental health of HE students. Previous literature (Binfet et al., 2018; Delgado & Toukonen, 2018; Dell et al., 2015; Hall, 2018; Trammell, 2017) found a range of benefits on student mental health after interacting with a canine. However as discussed in the systematic review and literature review (Chapter 1) there were a number of important design issues within CAI studies such as a lack of a control group (e.g. Binfet et al., 2018; Daltry & Mehr, 2015; Wilson, 1987, 1991; Wood et al., 2018), no record of the number of canines participants interacted with (e.g. Adamle, et al., 2009; Delgado & Toukonen, 2018), or for how long the CAI session lasted (e.g. Dell et al., 2015; Muckle & Lasikiewicz, 2017). One additional issue with several studies was the location data collection was carried out in as some studies took place in busy sites on campus with any number of external influences which could have affected the results (Daltry & Mehr, 2015; Dell et al., 2015; Hall, 2018). Based on this, it was determined it was important to explore whether CAI had a positive impact on the mental health of HE students using a RCT design in a private room limiting external influences.

Study 1 demonstrated that a 10 minute CAI session was effective in reducing anxiety and stress levels. While stress was reduced as measured by the DASS and VAS-Stress, this was not consistent across all anxiety measures. Anxiety was reduced as measured by the STAI and DASS but not the VAS-Anxiety. Depression as measured by the VAS-Depression and BDI was reduced but this was not the case with the DASS. However, the canine group recorded

significantly higher baseline VAS-Depression and BDI scores before interacting with the canine compared to the control group. This high depression score means there is a greater capacity to demonstrate a reduction in depression scores in the CAI group, therefore these results must be treated with caution.

The lack of significant effects for the VAS-Anxiety is difficult to explain given that VAS-Stress and VAS-Depression (taking into account pre-existing difference) did significantly reduce stress and anxiety. This may be due to the order of measures during data collection. Measures could have been presented to participants looking at one trait before moving onto the next (e.g., VAS-Anxiety and STAI followed by VAS-Depression and BDI and VASS-Stress). This may allow participants to focus on one trait at a time rather than moving back and forth between them. However, the DASS is a single measure incorporating depression, anxiety, and stress with questions for each trait combined rather than separated therefore if the study was to be carried out again, participants would still have to alternate between domains for the DASS. Despite this, both stress and anxiety subscales of the DASS were significant, yet the depression subscale was not.

Study 1 also found that those in the CAI group demonstrated less motivation after interacting with the canine than the control group. While interacting with a canine did reduce anxiety and stress, it may be these participants then felt less motivated as they were less anxious or stressed. The final expected result relates to the well-being scores and the lack of any significant effect of CAI on well-being as measured by the RYFF. This may be a result of participant fatigue as the Ryff is made up of 54 questions, some of which could be considered challenging to answer (e.g., In many ways, I feel disappointed about my achievements in my life, I gave up trying to make big improvements or changes in my life a long time ago, I sometimes feel as if I've done all there is to do in life). However given that none of the six facets of well-being demonstrated any improvement in well-being levels, it is possible the Ryff

is not sensitive enough to measure well-being in response to CAI, or that CAI has no influence on well-being.

Implications for Canine Assisted Intervention. Given that mental health issues in HE students is on the rise (Leung, 2017; House of Commons, 2020), and that universities are struggling to manage this increase (Thorley, 2017), it stands to reason that CAI could be an additional intervention to support these issues. The assumption is not that CAI could replace traditional forms of support (Brown, 2016; Hunt & Eisenberg, 2009; Rückert, 2015; Soet & Sevig, 2006; Tinklin et al., 2005), but that it could be used alongside these to provide additional or alternative support. One issue with traditional talk therapy is that one may feel their therapy/counsellor is not a good fit, does not meet their needs, or that the personal attributes of a therapist are not beneficial to the relationship between therapist and patient (Ackerman & Hilsenrpth, 2003). It is also possible that one may worry they will be judged or that their therapist will not understand them. With CAI, the participant is not required to talk about how they feel thus these worries are not an issue. Instead, the activity between participant and canine is simply to *be* and enjoy the moment without having to worry about how their words may make them, or the therapist feel. This, the act of being with a canine without having to talk or express one's feelings is important as it allows participants to experience positive feelings of happiness, feel relaxed, (Dell et al., 2015) and just *be* without having to explain or justify why. This is not dissimilar to third wave therapies such as acceptance and commitment therapy (ACT) where the process is holistic, and focus is placed on behaviour and cognitive development in relation to one's well-being rather than trying to address specific emotional symptoms (Hayes & Hofmann, 2017). In light of this, CAI could be used alongside existing therapies to support HE students during their time at university.

6.2.2 Study 2

Study 2 had a total of three aims. Research has determined that a range of CAI durations has a positive impact on various facets of HE students' mental health (e.g. 5 minutes, anxiety, Butteltmann & Römpke, 2014; 10 minutes, stress, Fiocco & Hunse, 2017; 15 minutes, stress, Crump & Derting, 2015; 15 minutes, anxiety, Lass-Hennemann, et al., 2018; 20+ minutes, stress, Adamle et al., 2009; 60+ minutes, well-being and stress, Ward-Griffin et al., 2018). However in line with the results of the systematic review (Chapter 1), these studies are not without their limitations which includes a lack of specific RCT design (Fiocco & Hunse, 2017), a lack of control groups (Adamle et al, 2009; Crump & Derting, 2015), and a lack of specificity in regards to duration, participant group numbers, or the number of canines participants interacted with (Ward-Griffin et al., 2018). Having determined CAI had a significant effect on anxiety and stress levels, the first aim of study 2 (Chapter 4) was to explore a range of CAI durations (2 minutes, 5 minutes, 10 minutes) to identify whether duration had an impact on the effectiveness of CAI. Study 2 had two further aims, to determine whether the effectiveness of CAI was affected by either the interaction between the human and canine, or by the canines' features.

Having demonstrated that 10 minutes was a suitable duration for effective CAI in reducing anxiety and stress, study 2 focused on duration and demonstrated there was no significant difference in the effectiveness of CAI with a 2 minute CAI session, a 5 minute CAI session or a 10 minute CAI session in reducing anxiety, stress or depression levels. These are vital findings as more students could take part in a 2 minute CAI session in an hour in comparison to 5 or 10 minutes, and regardless of the activity that took place, students would see an improvement in their anxiety, stress and depression levels. One result that differed from study 1 is that no significant differences were found in pre-measures in all groups meaning the reduction in depression as measured by the BDI is more interpretable in comparison to the

depression results found in study 1. That the VAS-Depression did not show a significant impact is difficult to correlate with BDI results. However the VAS is a simple one plot scale which may not be sensitive enough to measure something as complex as depression, whereas the BDI as a standardised measure is made up of 21 questions allowing for deeper analysis.

Despite the change in the well-being measure from the Ryff to the WEMWBS, well-being results in study 2 matched those of study 1. No improvements in well-being were seen as a result of interacting with a canine. While study 2 suggests the WEMWBS was not sensitive enough to measure well-being, it could be concluded CAI may not have an impact on well-being in the way it does on anxiety, stress, or depression. Indeed both studies 1 and 2 used independent standardised well-being measures (Ryff, WEMWBS) that have previously been successful on HE student population.

This may also be the case with the results of the interaction activity which demonstrated no impact on the effectiveness of CAI. This indicates it is not the type, or level of interaction that impacts whether CAI improves anxiety, stress, or depression, rather it is the simple interaction with a canine regardless of what form this interaction may be that has an effect. What was demonstrated was a relationship between cuteness and a reduction in anxiety, and cuddliness and a reduction in stress. This is important as it could be inferred that providing canines are cute or cuddly in stature and appearance, there will be a positive impact on stress and anxiety. What is not known is what cute and cuddly means for individual participants as it is possible Great Danes who are not typically considered cute in stature, or Dobermans who are not usually considered cuddly may be considered cute and cuddly by some. Importantly these results may contribute towards assessing whether the appearance of the canine may be beneficial for CAI.

Implications for Canine Assisted Intervention. Once again, based on the rise in students enrolled in HE reporting mental health issues (The Insight Network, 2020) in

combination with universities reporting a 94% increase in the need for counselling services (Thorley, 2017), that a student would gain the same benefit from 2 minute CAI session as a 10 minute session has a great implication on time, resources and finances. Traditional talk therapies are usually longer than 2, 5 or 10 minutes. There does not seem to be a theoretical reason why counselling or therapy sessions are between 45-60 minutes long, and an empirical search does not shed light on this, however anecdotal evidenced seems to suggest this traces back to Freud, and that an hour is convenient in regards to units of time. In a study examining walk in counselling, it was suggested an hour is beneficial to most (Slive & Bobele, 2012). If we accept this 60 minute session to be the minimum duration required to address a patient's needs, and that a 2 minute CAI session reduces anxiety, stress and depression, then there are potentially 30 sessions within an hour that students could benefit from CAI, rather than a singular session of talk therapy. As study 2 also identified that the interaction between human and canine had no impact on the benefits of CAI, watching the canines was as effective as physically interacting with them. This is a crucial finding as it means those who are less physically able or not physically able to interact with a canine can also benefit from CAI.

Simply put, the implication is that if students can benefit from the emotional reducing effects of CAI in a 2 minute CAI session in comparison to traditional talk therapies lasting 45-60 minutes then CAI would be far more efficient and financially attractive in addressing the mental health of HE students, and the a 94% increase in the need for counselling as reported by Thorley (2017).

6.2.3 Study 3

Study 3 (Chapter 5) had two aims. Having established a link between the effectiveness of CAI and duration, this being that a shorter CAI session is as effective as a longer CAI session, the first aim of study 3 was to determine whether the social environment participants experienced CAI in influenced the positive impact of CAI. The final aim was to determine whether participants interaction style predicted the effect of CAI. While there is research documenting the relationship between attachment style and the social environment (Collings & Feeney, 2000; Fraley & Davis, 1997; Hazan & Shaver, 1987), there seems to be a lack of research that explores CAI and attachment style though research has been carried out on owner attachment style and the support seeking behaviour of their dogs (Rehn et al., 2017).

Study 3 demonstrated there was no difference whether participants took part alone, in a pair or in a trio in reducing anxiety, stress or depression, and in increasing well-being, optimism, confidence, cheerfulness, relaxation, or feeling loved. The interaction style results however, were conflicting. As expected, participants with an enmeshed attachment (proximity seeking) style who took part in CAI in pairs experienced an increase in relaxation. However, one unexpected result was that those with a fearful/angry (insecurity/mistrust) attachment style, who tend to struggle in a group environment found an increase in cheerfulness and confidence when taking part in pairs. The result that those with an enmeshed attachment style (proximity seeking), who fear separation and may respond better in groups, found a reduction in depression when interacting with a canine alone was also unexpected. That these results do not correspond to what is known of attachment styles theory is difficult to explain, however it must be pointed out that attachment style was developed based on how humans relate to other humans, not how humans related to canines therefore it may be attachment style in its current knowledge, has no bearing on CAI and how humans respond to canines either individually, or in small groups.

Implications for Canine Assisted Intervention. Having determined there was no difference whether students took part individually, as part of a pair, or as a trio, taking part in CAI in a group has clear financial benefits. If more than one person can be seen in one session, the cost of the session is shared across participants therefore reducing the costs of an individual participant. This demonstrates CAI is of greater financial value than individual talk therapies. There is also the added benefit that group therapy helps to normalise experiences and emotions (Harper & Cole, 2012), and allows individuals to be seen and heard by others with similar issue, or in some cases who may struggle differently but all experience the same emotions (Courtois & Ford, 2009).

Taken together, the aims and results of the three studies move beyond research that found similar results with one student taking part in CAI in longer durations (Buttelmann & Römpke 2014; Crossman et al., 2015; Lass-Hennemann et al., 2014, 2018) meaning that in one short 2 minute CAI session, up to three students will experience a reduction in anxiety, stress and depression. The simple fact that more students will benefit from CAI in a 2 minute session compared to traditional 45-60 minute talk therapy is compelling. For universities who are seeing a surge in mental health issues and an increase in demand counselling, this could be a significant change in support provided. Not only will it place less demands on financial budgets, but it also demands less time and physical resources which in itself benefits university resources which may then be allocated elsewhere.

6.3 Strengths of the Thesis

The results of this thesis bears a number of important strengths.

6.3.1 RCT

The literature and systematic reviews (Chapter 1) identified a lack of CAI related studies that used a RCT study design meaning there was a lack of rigor to create balanced and unbiased participant groups. Studies 1 and 2, (Chapters 3 and 4) used a RCT design, addressing many of the limitations and allowed effective exploration using an experimental approach, a suitable control group and specific durations. The use of a RCT also allowed the results to be evaluated knowing they had been gathered using a scientific approach.

6.3.2 Duration

The findings from study 2 (Chapter 4) demonstrated that the groups students participated in (2, 5, 10 minute CAI) made no difference on the impact of CAI in relation to anxiety, stress and depression is particularly significant as it means universities need only offer CAI for 2 minutes for students to experience a benefit. The cost, both in terms of financial and resources of CAI then becomes far more accessible in comparison to a traditional one to one counselling session.

6.3.3 Interaction activity

Study 2 also demonstrated that the activity between human and canine had no impact on the effectiveness of CAI. Given that Wilson and Martin (2017) report the number of disabled students in HE is increasing it suits universities to be able to provide support that is suitable for all students regardless of their abilities to access them. Therefore, this finding is of great value as it means students who are less able or physically unable to interact with a canine will also benefit from taking part in CAI by simply watching the canine.

6.3.4 Social environment

Study 3 (Chapter 5) determined that group numbers (1, 2 or 3) had no impact on the effectiveness of CAI on anxiety, stress, and depression levels. Similar to study 2, this result means a greater number of students (maximum 3) can take part in a single 2 minute CAI session and will in turn, have a significant positive impact on costs and resources.

6.3.5 Depression

Studies 2 and 3, (Chapters 3 and 4) both demonstrated CAI has a positive impact on depression levels. This is a significant finding as both study 1 (Chapter 3) of this thesis, and the limited CAI studies identified in the systematic review (Chapter 1) that focused on depression in HE students found no positive impact of CAI on depression levels. In addition this finding begins to build a foundation of CAI that can help to support depression in HE students.

6.3.6 Location

Rather than carrying out data collection in a busy public area with any number of external influences (e.g., Daltry & Mehr, 2015; Dell et al., 2015, Hall, 2018), CAI sessions were carried out in a quiet room. In addition, aside from the researcher, no one else took part therefore interruptions were limited.

Taken together, these elements are ground-breaking, particularly as they are the first studies to determine (1) that a short CAI session (2 minutes) is as effective as a longer CAI session (10 minutes) in reducing anxiety, stress and depression, and (2) that the group number of participants in a CAI session (1, 2 or 3) has no bearing on the positive effects experienced in reducing anxiety, stress, depression and in increasing well-being.

6.4 Framework for Canine Assisted Intervention

A secondary purpose of the thesis was to use the results to identify optimum parameters for effective and efficient CAI. There are a number of key text that outline recommended codes of practice for animal assisted interventions. The Handbook on Animals Assisted Therapy (2006) edited by Dr. Aubrey Fine appears to be a well respected source of information having been cited in a number of CAI papers (Adamle et al., 2009; Binfet & Hartwig, 2019; Crossman, et al., 2015; Grajfoner, et al., 2017; Spurin et al., 2020; Thelwell, 2019; Trammell, 2019; Ward-Griffin, et al., 2018). Fine and colleagues (2006) present several case studies relating to AAI and discuss how to design and implement an AAI program, including guidelines for the animal's welfare and behaviour, participants, and human knowledge and responsibilities. The Animal Assisted Interventions: SCAS Code of Practice for the UK (Society for Companion Animals Studies, 2019) outlines terms of use with CAI, participants and their suitability, the animals, and their welfare, and the planning and implemental of the AAI. They also discuss the qualification and training of the human AAI team, health and safety, risk assessment and ethical considerations. The International Association of Human-Animal Interaction Organizations (sic), (2018) whose taskforce includes Dr. Aubrey Fine, outlines terms of use, human and animal welfare, animal suitability, human knowledge and contribution and specifically states animals should not work for longer than 30-45 minutes. The Animal Assisted Intervention International Standards of Practice (Animal Assisted Intervention International, 2019) discusses the welfare of the canines, the handler's knowledge and contribution, and participants welfare and ethical treatment. In addition, they discuss standards of practice for AAT, AAA, Animal Assisted Education (AAE), which includes preparation, ethics and professional qualifications, staff competencies, mentoring and supervision of canines and handlers, goal directed activities and insurance and legislation.

More recently, Binfet and Hartwig (2019) published *Canine-Assisted Interventions: A Comprehensive Guide to Credentialing Therapy Dog Teams*. This focuses on CAI within specific context's, the canine human team, best practice, and the assessment of the CAI team. The welfare of humans and canines is also discussed and within these, key recommendations are made as to the durations a canine should provide CAI for and how many CAI sessions they should take part in, both of which are determined by factors such as the type of client (i.e. child, adult etc) and the environment CAI is carried out in (i.e. busy public area). However, despite these well informed guides, none seem to suggest exact parameters to ensure effective application of CAI. Therefore, based on the findings of this thesis, and that Serpell et al. (2020) in a study exploring standards and practices of therapy dog organisations in the U.S. found that almost half of the organisations examined had no limit in the length of time canines should provide CAI for, a proposed framework is presented below. A plain language flyer using clear and simple words has also been produced (Figure 16). This provides practical advice that is solidly grounded in the findings of this thesis and can be used for those in HE who might be interested in experimenting with CAI.

6.4.1 Participant

CAI is suitable for HE participants to support their anxiety, stress, depression, or well-being however they must not be frightened of canines or be allergic to them or other animals. Based on the results of study 3 that determined there was no difference between taking part in CAI individually, in a pair or as a trio, participants need not come with a friend. This may be more relevant in the first year when students may not know many people and are unable to have someone join them in CAI. However CAI is still suitable for those who take part with friends (see study 3, Chapter 5), and as the age range of study 1 included post graduate students, CAI is also suitable for older students to address their anxiety and stress levels.

6.4.2 Social Environment

The numbers of participants in each CAI sessions should range from one to three as it was demonstrated there was no difference in effectiveness in these number of participants.

6.4.3 Duration

CAI should have a minimum of a 2 minute un-interrupted duration. Five and 10 minutes are also effective in reducing anxiety, stress, and depression.

6.4.4 Interaction

There is no difference in the effectiveness of a range of interaction activities including those who only watched the canine. It is the simple interaction with a canine that is the key, not the form the interaction takes. Providing the participant is in the same room and can clearly see the canine, they will experience a benefit from CAI.

6.4.5 Location

CAI should be carried out in a private room where there are no external influences (other than other participants and canine handler) that might distract from CAI.

6.4.6 Handler

The handler should be present to monitor both canine and participant but should not be actively involved in the intervention. The interaction should only take place between the canine and participant/s.

6.4.7 Canine

Only one canine should be present in any one CAI session. No more than four CAI sessions should be booked to ensure the canine is not stressed. The room should also have a specific area where the canine may retreat to should they need a break. Participants and the handler should not enter this area and the canine must be allowed to come out of this area in their own time. The canine should have a 15-25 minute break between sessions and be taken outdoors as soon as possible after the final CAI session ends. They should also be removed from the room if they display any aggressive behaviour or show signs of fear or anxiety.

Figure 16
Plain Language Flyer for CAI Framework

Framework for Canine Assisted Intervention (CAI)

To follow is a framework for CAI that can be used for those in HE wanting to experiment with CAI.

Participants

CAI is suitable for Higher Education students experiencing feelings of anxiety, stress or depression, or those wanting to improve their general feelings of well-being however all participants must have no fear of dogs or allergies to any other animals.

Number of participants per session

Students can take part either on their own or with 1 or 2 friends.

Duration

Students should spend a minimum of 2 minutes with the dog to feel the benefits. Longer periods such as 5 or 10 minutes are also beneficial.

Interaction

It is entirely the student's decision how they choose to play with the dog. It does not matter if they only watch or if they choose to pet, stroke, or throw a toy for the dog, they will still benefit from this interaction. The most important thing is that students can see the dog.

Location

It is important the CAI sessions take place in a private room so there are no interruptions to the session as this might distract the participants or the dog.

Handler

The dog's handler should stay in the room during the session to monitor the dog but should not be involved in the session.

Canine Care

Only 1 dog is required during any 1 CAI session. The dog should not take part in more than 4 CAI sessions. A specific dog only area must be provided should the dog feel the need to retreat. If the dog enters this area, it must be allowed to come out in its own time. The dog must also be removed at the first sign of aggression, fear, or anxiety. The dog should have a minimum of a 15 minute break between CAI sessions and be allowed regular toilet breaks.



6.4.8 Limitations

There are a number of limitations in the research that should be factored in when considering the results of this thesis.

6.4.9 Recruitment

Following the ethical policy set out by Middlesex University Ethics Committee, the recruitment posters and information on SONA, Middlesex University's online recruitment system had to clearly state what would be examined during the session meaning students would have been able to deduce the general aim of the studies. As students self-selected to take part, they may have already been experiencing anxiety, stress, and depression. Participants were also not identified as having a diagnosed condition (e.g., generalised anxiety syndrome or clinical depression), therefore it could be suggested the outcomes may differ if the participations were clinically diagnosed. Alongside this it could be suggested canines provide a distraction from anxiety, stress, and depression rather than treating the condition if participants suffer from situational anxiety, stress, or depression. This thesis did not set out to treat diagnosed conditions however future work would benefit from utilising a sample of participants with clinical conditions.

6.4.10 Participants

As participants self-select to take part knowing they may have the opportunity to interact with a canine the sample may not represent a larger student population with less interest in canines. A similar issue presents with self-selected bias as participants who expressed the desire to interact with a canine were more likely to take part and participants in the control group may have faced disappointment at the lack of canine interaction.

6.4.11 Canine participation

Although the nature of the interaction was participant led, it relied upon the willingness of the canine to interact with the human participant potentially leading to a lack of consistency in the interactions across participants.

6.4.12 Gender balance

Given that the participants were predominantly female (181 females (84%) and 34 males (16%)), it would be unwise to generalise the findings to a broader HE population, or to all males. More effort to recruit a larger sample of male participants would have strengthened the results of the study giving a better distribution across genders and more strength to the generalisation of results across a HE population.

6.4.13 Self reporting measures

All the measures used were exclusively self report measures. Despite the measures being suited to assess individual participants experiences, exaggerated answers may be given, and social desirability and demand characterises may be an issue.

6.4.14 Strong correlations between anxiety, stress, and depression

Throughout all three studies, depression, stress, and anxiety were regularly correlated. It could be argued this is a positive outcome. For instance, if CAI has a positive impact on anxiety levels, it has a similar positive impact on stress and depression and vice versa. However this correlation also suggests that CAI may not simply have an effect on one domain, but instead some combination of all three. It is also possible that true results are distorted because of this. For instance, anxiety levels may be reduced not because participants are less anxious because of CAI, but because they are feeling less stress from CAI and this reduction

in stress levels is bleeding through and reducing anxiety levels. The correlations could suggest it is difficult to identify exactly what CAI addresses. Do participants experience a reduction in anxiety, stress, and depression, some combination of all three, or do participants 'simply' feel better therefore their mental health is to some extent also 'better'? One suggestion is that there needs to be a better understanding about the exact changes' participants experience as the correlations between anxiety, stress, and depression seem to indicate those who experience depression also experience anxiety and stress, which may naturally have a direct impact on student well-being and mental health.

One last area where these correlations may have value falls under the discipline of transdiagnostic therapy. A transdiagnostic approach does not address the categorical diagnosis (e.g., anxiety, stress, or depression), rather it acknowledges that within a range of diagnoses, common, overlapping features such as avoidance, unhelpful thoughts or behavioural issues exist (Harvey, 2004). These features which underpin the diagnosis then become the focus of transdiagnostic therapy. Based on the correlations between anxiety, stress, and depression, it is possible that CAI may be able to support this theory, however further research is required to better understand the possibility of a link between CAI and transdiagnostic therapy. Specific targeted research is recommended to partial out the effect of CAI on anxiety, stress, and depression to give clarification into the individual results of CAI on these three domains.

6.5 Implications for future work

While this thesis explores and demonstrates a range of important findings, there are several areas that require further research. The main points are presented below.

6.5.1 Depression

The results for depression levels were inconsistent across all three studies. Study 2 suggested there was an effect of CAI on depression using the BDI, which has been successfully used to measure depression (Beck, et al., 1996; Ediz, et al., 2017; Hart Abney, et al., 2018; Sakellari, 2020; Shearer et al., 2016), and study 3 found the same, this being that there was an effect of depression using the VAS-Depression. The issues lie with the results in study 1 in that they are interpretable due to the pre-existing differences. It is difficult to reconcile the difference in these results, especially given that depression can be such a debilitating condition (Greenberg, et al., 2003; Lorenzo-Lucas, 2015), however any therapy that can alleviate any feelings could be seen to be beneficial.

What does not support the results of study 2 and 3 is existing CAI literature relating to depression. The systematic review (Chapter 1) found not only a lack of CAI research that measured depression, but also that of the two that did (Hall, 2018; Shearer et al., 2016), there was either no significant depression between groups (Shearer et al., 2016), or that there were issues with baseline scores resulting in the author discarding depression results (Hall, 2018). What makes this even more perplexing is that Shearer et al. (2016) used the BDI to measure depression. The study also used HRV as a physiological marker which might have had an impact on results however this was to explore the impact of CAI on stress. What is certain is that further exploration is required into the impact of CAI on depression in HE students to better understand this.

Given that the literature review found depression in HE student is on the rise (The Insight Network, 2020), it is unclear why there is not more CAI research dedicated to depression. It may be that the lack of existing peer reviewed research is a deterrent to this area, or that depression is a complex condition that can be difficult to diagnose (Trivedi, 2004) or misdiagnosed with false positives (Mitchell et al., 2009). In turn it may be difficult to address depression with non-traditional interventions such as CAI. It may simply be that in the case of study 1, the VAS-Depression and BDI were not sensitive enough to measure depression, or that CAI is not an effective intervention for HE student depression levels, however the results of both studies 2 (BDI) and 3 (VAS-Depression) contradict this argument.

Future CAI research would benefit from exploring CAI and depression through the application of a range of depression measures to determine whether there is a positive relationship between CAI and depression in HE students. It would also be important to explore this in relation to longer durations of, and regular CAI sessions. While this thesis demonstrates a 2 minute CAI session was effective in reducing depression levels, it may be that as depression is a long term condition that may require constant care (Keller, 2018). CAI research would benefit from exploring the long term application and benefits of regular interaction with a canine. While study 3 found no difference in groups after interacting with a canine, it would be beneficial for the social element to be re-addressed by factoring this in as it may be that the added element of a shared experience may normalise participants experiences (Harper & Cole, 2012), and have a positive impact on depression levels.

6.5.2 *Well-Being*

Well-being also generated conflicting results between studies 1 and 2 which found CAI had no impact on well-being, and study 3 which did. The key difference is that studies 1 and 2 used standardise measures, whereas study 3 used a measure that mirrors the look and application of VAS's used throughout the thesis. The result of this was that study 3 found a significant increase in well-being following CAI regardless of the social environment. This finding is interesting and poses two possibilities. It may be that the simple VAS format was better at identifying an increase in well-being resulting from CAI. It is also possible the Ryff and WEMWBS are not sensitive enough to measure well-being in HE students though given that studies have successfully used both the Ryff (e.g., Hu & McCormic, 2012; Kyeong, 2013; Otálora & Barros, 2014), and the WEMWBS (e.g., Cilar et al., 2020; Gorczynski et al., 2020; Kannangara et al., 2018) on an HE population, it seems more likely the measures may not detect short term changes following CAI. It is also possible that the Ryff and WEMWBS are not suitable measures to identify an impact well-being as a result of interacting with a canine.

There is also the argument that well-being is a vague term and can have any number of meanings. It has been argued it can relate to one's health, how one's life currently is for that person, or what might be *good* for a person or even relate to perceptions of happiness (Crisp, 2017). Additionally, Ryff and Keyes (1995) suggest well-being relates to one's employment and income, social relationship, and neighbourhood. It may be that well-being, like depression, is difficult to define and in being difficult to define is difficult to measure. Based on this, future research in the field of CAI and well-being would benefit from the application of a range of well-being measures to determine the relationship between CAI and well-being. In addition, longer durations of CAI in relation to well-being should be explored to understand whether well-being requires longer CAI durations than anxiety, stress, and depression, and most

importantly, future research should further explore the relationship between CAI, well-being and social environment.

6.5.3 Group size

One recommendation for future work in relation to the social environment participants experienced CAI in is to explore whether participants in larger CAI groups also experience a reduction in anxiety, stress and depression and an increase in well-being. Based on previous research it has been determined that larger groups of 10-15 (Stewart, et al., 2014) found self-reported anxiety levels were reduced, and in Daltry and Mehr's (2015) study, students experienced CAI in groups of 15-20 concluding they experienced relief from stress. However neither of these studies compared results against a control group therefore exploring the effects of CAI in groups larger than three participants using a RCT design has important implications. Given that study 3 found three students could take part in CAI in a brief 2 minute session and experience a reduction in anxiety, stress and depression and an increase in well-being, that a greater number of students could take part in CAI together and potentially experience a reduction in anxiety, stress and depression, and an increase in well-being has a vital implication on time and financial resources. This could in turn make CAI more attractive to universities looking to support students struggling with their mental health.

6.5.4 Canines

All three studies used either Elvis or Dahlia, or a combination of both in all the CAI sessions. Both are small and neotenous looking with features such as big eyes, small noses and mouths and a protruding forehead, clear examples of baby schema (Borgie et al., 2014). As such they are considered cute in appearance which may affect how participants approach and interact with them. It would be reasonable to suggest that canines that are bigger in size and

stature such as a Great Dane or a Greyhound may affect how participants approach and receive the canines. Based on this, CAI would benefit from determining whether a difference in canines breed and appearance has an impact on the effects of CAI on the mental health of HE students.

6.5.5 The impact of long-term studies

None of the three studies explored long term results of CAI. Longitudinal research is required to identify the durability of the effects, in particular to understand how long the benefits of a singular short CAI would last, and whether regular CAI sessions would have a greater impact on anxiety, stress, depression and well-being. However one would need to take in consideration that as participants became accustomed to CAI, it may be difficult to control for what may take place between data collection sessions and subsequently impact the results. Additionally, there is the possibility of participants becoming too familiar with the study increasing the likelihood of demand characteristics and social desirability.

6.5.6 Intervention Activity

Study 2 investigated the relationship between CAI and intervention activity. Rather than finding one was more effective than the other, it was determined there was no difference between intervention activities and that it was the act of interacting with a canine, regardless of the activity that was sufficient to reduce anxiety, stress, and depression levels. However, as petting and talking to the canine were the most common interactions, the range of interactions were not very broad. Future research would benefit from measuring interaction activity again and instructing participants to only adopt one specific interaction activity e.g., *watch only* or *play only* to determine the specific impact of individual intervention activities.

6.5.7 Single Canine Assisted Intervention session

The thesis is limited by the single dose of CAI as this gives no insight into either the long term application of, or effect of CAI. Future research should examine the mental health of HE students who have received regular CAI sessions over a long term period to explore whether CAI has a long term effect on supporting the mental health of HE students.

6.6 Conclusion

The overall result of this thesis supports the conclusion that CAI is a valid form of support for HE students struggling with mental health issues, specifically anxiety, stress, depression and general well-being. The three studies logically navigate their way through the application of CAI using a RCT design (Studies 1 and 2) to examine the impact of CAI, CAI duration and the social environment of CAI. The thesis successfully addresses the individual aims, finding that (1) CAI is effective in reducing anxiety, stress, depression and well-being in HE students though these results were measure dependent. The thesis also found (2) that a short duration (2 minutes) is as effective as a longer duration (10 minutes), and (3) the group number that students' experience CAI in (either individually, as part of a pair, or as part of a trio) has no bearing on the positive impact of CAI. Additionally canine traits had no impact on the effectiveness of CAI on anxiety, stress, depression, and well-being and neither were the intervention activities between canine and human predictors of these.

These results, establish CAI as an additional support system that universities can use alongside existing support to address the increase in mental health issues that new cohorts of students arrive with and experience during their time in HE. It is important to stress that it is not appropriate to assume that CAI may replace the process of traditional talk therapy when

dealing with issues students may face during their time in HE, but rather that it can work alongside traditional methods in order to alleviate anxiety, stress and depression. This form of support is economical as many students can take part in and benefit from a short-term CAI session which may make CAI attractive to universities, allowing the budget for student mental health to stretch further. The thesis also provides a framework as to the management of key elements when applying CAI in an HE population to address issues with their mental health. The thesis it is not without its weaknesses, however the results do provide an accurate and deeper understanding of the mechanics behind CAI that add to, and further current CAI literature in terms of theoretical findings and practical application. Therefore further research is required to identify optimum parameters for effective CAI intervention which is possible providing one has the time, the space, and the dog 🐕.

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Appendices

Appendix A

Table 1

Summary of First Author and Date, Terminology, Sample Size, Participant Age, Number of Sessions, Timing, Group Numbers, Canine Per Group, Study Design, Measures Used, Intervention Activity, Outcome Post Intervention and Study Quality.

First Author / Date	Terminology	Sample size	Participant age	Number of sessions	Timing (mins / hours)	Group numbers	Canine per group	Study design	Measures used	Intervention activity	Outcome post intervention	Study quality EPHP
Adams, N. 2009	Pet Therapy	246	17-25	1	20 minutes + 1 session	50	5	Intervention only	Pet Therapy Program questionnaire	Canine interaction	Pet therapy program could be a temporary substitute to fill the void left by previous support systems for stressful periods and could be a catalyst to form new relationships	3

Barker, S., B. 2016	Therapy Dog Intervention	78	18+	1	15 minutes	Not specified	5	Intervention and control group	Perceived Stress Scale (PSS), stress VAS, sNGF	Intervention group: Canine interaction. Control group: drawing a diagram representing current life situation	A brief dog intervention therapy session statistically reduces students perceived stress	2
Binfet, J., T. 2016	AAT	44	18-22	8	45 minutes	3-4	1	Intervention and control group	McAndrew's Measure of Rootedness, Satisfaction with Life Scale, Connectedness to Campus, Focus group	Intervention group: Canine interaction. Control group: Informed they were on an 8 week 'wait list' and to continue with usual daily business	AAT reduced feelings of homesickness, increases feelings of satisfaction with life, feelings connected to campus and the well-being of 1st year students' experiences with homesickness	3
Binfet, J., T. 2017	Canine Therapy	163	17- 49	1	20 minutes	3-4	1	Intervention and control group	PSS, Homesickness Questionnaire, Sense	Intervention group: Canine interaction. Control	A 20 minute canine therapy session reduces stress	3

									of Belonging Scale	group: Course based reading material	and homesickness, and increases an affinity for campus community	
Binfet, J., T. 2018	Canine Therapy	1960	--	6-7	20 minutes	3-4	1	Intervention only	VAS-Stress	Canine interaction	Canine therapy intervention reduces stress	3
Buttelmann, D. 2014	AAT	71	18.8 - 29.8	1	5 minutes	1	1	Intervention, comparison, and control group	STAI, Audience Anxiety Scale, PAS, systolic/diastolic BP and HR	Intervention group: Canine interaction. Comparison group: fish and plant interaction. Control group: No interaction, participants asked to 'wait'	All 3 conditions found anxiety reducing effects. The canine group was no more effective than the fish comparison group but was more effective than the plant group	2
Crossman, M. 2015	Animals Visitation Program (AVP)	67	22-37	1	7 + 3 optional minutes	1	1	Intervention, comparison, and	STAI, Positive and negative affect schedule	Intervention group: Canine interaction. Comparison group:	AVP reduces anxiety and negative mood and increases positive	3

								control group	(PANAS), Credibility /Expectancy Questionnaire, Semantic Differential, Experiences with Dog Inventory	Viewed images of the canine. Control group: No interaction, participants asked to 'wait'	moods. Supports existing AVP already in use	
Crump, C. 2015	Study 1 - AAA	27	18-25	1	15 minutes	4	2	Intervention and control group	Stress Arousal Checklist, BP, HR	Intervention group: Canine interaction. Control group: took part in non-stressful activity including playing cards, listening to music, read and texting	AAA decreases psychological stress and increases psychological arousal. No significant effect on diastolic BP, HR or levels of salivary cortisol	3
	Study 2 - AAA	61	18-25	1	30 minutes	4	2	Intervention group only	Stress Arousal Checklist, BP, HR	Canine interaction	AAA decreases psychological stress and	3

											increases psychological arousal. No significant effect on diastolic BP, HR, or levels of salivary cortisol	
Daltry, R., M. 2015	Dog Therapy Outreach Program	54	18-32	15	2 hours	15-20	2	Intervention only	Informal evaluation form	Canine interaction	Provides stress relief and comfort, and increases potential access to counselling services	3
Delgado, C. 2018	Canine Play Intervention	48	18-57	1	15 minutes	1	1	Intervention only	PSS, VAS-Mood, BP, Cortisol	Canine interaction	Dogs can moderate effects of stress. Improvement in mood and perceptions of stress and a positive change in psychological measures	3
Dell, C., A. 2015	Dog Therapy Program	403	--	2	5-60 minutes, no	Not specified	--	Intervention only	PSS, VAS-	Canine interaction	Therapy dogs offer love and support	3

					clear record				Mood, BP, Cortisol		and reduce stress	
Fiocco, A., J. 2017	Therapy Dog	61	18-47	1	10 minut es	1	1	Interve ntion and control group	Therapy dogs offer love and support and reduce stress	Intervention group: Canine interaction. Control group: No interaction, participants told to relax	Interacting with a dog for 10 minutes may significantly buffer stress response to a subsequent stressor	3
Grajfner, D. 2107	Dog-Assisted Intervention	132	17-34	1	20 minut es	1	1	Interve ntion and control group	WEMWB S, STAI, UWIST, Mood Adjective Check List (UMACL)	Intervention group: Canine + handler interaction. Control group: Handler interaction	20 minute session led to significantly greater improvement s in student well-being and anxiety	3
Griscti, O. 2020	Phase 1 -Dog Therapy	24	20-31	8	2.5 hours	24	1	Interve ntion and control group	Wrist HR monitor	Canine present during a lecture	The presence of a dog reduces stress	3
	Phase 2 -Dog Therapy	38	--	8	2.5 hours	38	1	Interve ntion and control group	Purpose written questionna ire	Canine present during a lecture	The presence of a dog has a calming effect on students	

Hall, D. 2018	Therapy Dog	109	21-56	60	2-30 minutes, no clear record	Not specified	1	Intervention and control group	Hospital Anxiety and Depression Scale (HADS),	Intervention group: Canine interaction Control group: No canine interaction over the duration of the study	Therapy dogs on campus during a semester decrease anxiety symptoms	3
Jarolmen, J. 2018	AAT	86	18-39	1	15 minutes	Not specified	1	Intervention and control group	Systolic/diastolic BP	Intervention group: Canine interaction. Control group: No canine interaction, participants were asked to sit behind a privacy screen	Significant difference found in the reduction in BP levels between experimental and control group. BP viewed as an indication of anxiety levels	3
Lass-Henemann, J. 2014	Therapy Dog	80	--	1	11 minutes	1	1	Intervention, comparison, and control group	STAI-S, PANAS, systolic, diastolic BP, ECG, Cortisol, STAI-Trait, PAS	Activity: traumatic film clip Intervention group: Canine	Presence of a dog reduces subjective experienced anxiety and negative affect after a	2

										interaction. Comparison group: toy dog or friendly person companion. Control group: Alone	traumatic film clip	
Lass-Henne mann, J. 2018	Therapy Dog	60	--	1	15 minutes	1	1	Intervention, comparison, and control group	STAI-State, PANAS, systolic, diastolic BP, ECG, Cortisol, STAI-T, PAS, BDI	Intervention group: Canine interaction. Comparison group: participants watched a video of canine interaction. Control group: No interaction, participants told to relax alone	Presence of a dog reduces subjective experienced anxiety, less negative affect, and more positive affect after a traumatic film clip	3
Machová, K. 2020	AAA	93	19-44	1	10 minutes	1	1	Intervention, comparison, and	Purpose written questionnaire. BP, HR.	Intervention group: Canine interaction. Comparison	AAA significantly improves mood and stress but not	3

								control group		group: relaxing tasks Control group: No interaction, activity not given	HR or BP was HAI	
McArthur, A., D. 2018	Study 1 - AAT	80	--	1	90 minutes	Not specified	6	Intervention only	Purpose written questionnaire	Canine interaction	AAT improves self-reported perceived mood	3
	Study 2 - AAT	38	--	1	90 minutes	Not specified	6	Intervention only	Purpose written questionnaire. Brief Mood Introspective Scale	Canine interaction	AAT improves mood (pre compared to post)	3
Muckle, J. 2017	AAA	62	--	3	60 minutes	Not specified	Unclear	Intervention and comparison group	Animal Attitudes Scale, PSS, STAI, State Self Esteem Scale, systolic and diastolic BP	Intervention group: Canine interaction. Comparison group: Quiet reading	AAA has a positive effect on psychological and physiological markers of stress. Reductions found in perceived anxiety,	3

											systolic BP and state self- esteem	
Shearer, A. 2016	Phase 1- AAT	26	--	4	60 minutes	Not specified	1	Intervention and control group	STAI (mood inventory) , PANAS, BDI, Five Facet Mindfulness Questionnaire, HRV,	Intervention group: Mindfulness meditation. Active control group: Canine interaction	AAT reduces anxiety	2
	Phase 2- ATT	48	--	4	60 minutes	Not specified	1	Intervention, comparison, and control group	STAI (mood inventory) , PANAS, BDI, Five Facet Mindfulness Questionnaire, HRV	Intervention group: Mindfulness meditation group. Comparison group: Canine interaction. Control group: no interaction, no activity given	AAT reduces anxiety	
Silas, H., J. 2019	CAI	754 students	--	1	90 minutes	126	15-17	Intervention only	VAS- Stress	Canine interaction	CAI reduces student and handler stress however canines stress	2

		40 handles *	17-60	6							increased (compared to measures of observed home stress) as a result of performing CAI	
		40 canines *	Bitches Mage = 4.75	6								
			Dog - not stated									
Spruin, E. 2021.	Therapy Dog	94	18-46	1	30 minutes	1	1	Intervention, comparison, and control group	STAI, Mood Tracking Scale	Intervention group: Canine interaction. Comparison group: Mindfulness. Control group: Psychological support with a student advisor	Therapy dogs reduces anxiety as effectively as mindfulness therapy	3
Stewart, A. 2013	Human Animal Interaction	128	18-57	1	13.5 minutes	1	1	Intervention and	STAI	Activity: Clerical tasks.	Companion animals may provide stress	2

								compar ison group		Intervention group: Canine interaction. Comparison group: No canine interaction during clerical task	relief for those in average stress jobs with positive feelings about companion animals but may have no effect for those in high stress jobs who do not already enjoy animal companionsh ip	
Stewart, A. 2014	AAT	55	--	20-24	2 hour drop in sessio n	10-15	1	Interve ntion only	Burns Anxiety Inventory, University of Philippine s Loneliness Scale, Session Rating Scale, Outreach program	Canine interaction	AAT decreases self-reported anxiety and loneliness. AAT outreach intervention programs may be effective and efficient in supporting the demands	2

									evaluation form		of the expanding student body	
Thelwell, E., L., R. 2019.	Dog interaction	82	18-23	1	10 minutes	1	1	Intervention and control group	PAS, STAI, PANAS-Expanded form	Intervention group: Canine interaction Control group: Watch a video about dogs	Dog interactions reduced anxiety levels and improved mood scores.	3
Trammell, J., P. 2017	Study 1 - Therapy Dogs	127	--	1	2 hour drop in session	Not specified	7	Intervention only	Purpose written stress questionnaire	Canine interaction	Therapy dogs are associated with a small decrease in stress	3
	Study 2 - Therapy Dogs	44	--	1	15 minutes	Not specified	6	Intervention and control group	Purpose written stress questionnaire	Intervention group: Canine interaction. Control group: Watch a movie about dogs	Therapy dog group showed larger reductions in stress compared to the control group. There was no relation to exam performance	3

	Study 3 - Therapy Dogs	45	--	1	15 minut es	Not specified	5	Interve ntion and control group	Purpose written stress questionna ire	Intervention group: Canine interaction. Control group: Watched a movie about dogs	Therapy dog interaction immediately after a class had no effect on exam related stress reduction. However a (small) reduction in stress did predict better exam related performance	3
Tram mell, J., P. 2019.	Therapy Dog	44	--	2	Not specif ied	2	1	Interve ntion and control group	Affect measures, PSS	Activity: learning task Intervention group: Canine interaction. Control group: Alone	Interacting with a therapy dog decreases arousal and stress and increases happiness	3
Ward- Griffin , E. 2018	Therapy Dog	246	--	1	90 minut es	Not specified	7-12	Interve ntion and control group	Satisfactio n with Life, Subjective Happiness Scale, PANAS, PSS, Medical	Intervention group: Canine interaction. Control group: No canine interaction over the	Therapy dogs on campus can have a positive effect on student well- being including reductions in	3

									Outcome Study Social Support Survey	duration of the study	stress and an increase in happiness and energy levels immediately post interaction. Negative affect and perceived stress decreased, and perceived social support increased 10 hours post-intervention	
Wilson, C., C. 1987	Effect of Pet	92	18-39	1	3 x 10 minutes	1	1	Intervention only	STAI, Pet Attitude Inventory, BP, HR	Reading aloud, reading quietly, and canine interaction	Interacting with a pet affects physiological and psychological response by lowering response levels and reduces anxiety levels	3

Wilson, C. 1991	Effect of Pet	92	18-39	1	3 x 10 minutes	1	1	Intervention only	STAI, Pet Attitude Inventory, BP, HR	Reading aloud, reading quietly, canine interaction (all participants)	Interacting with a pet affects physiological and psychological response by lowering response levels and decrease anxiety levels	3
Wood, E. 2018	Dog-Assisted Therapy	131	--	1	15 minutes	6	1-2	Intervention only	STAI, BP	Canine interaction	Decrease in state anxiety and systolic and diastolic BP	3

* Excluded from data extraction figures

Appendix B

Ethical approval from Psychology Research Ethics Committee at Middlesex University

Study 1



Psychology REC

The Burroughs
Hendon
London NW4 4BT

Main Switchboard: 0208 411 5000

09/06/2017

APPLICATION NUMBER: 1617

Dear Karen Manville

Re your application title: Canine visitation - quantitative - clinical/health

Supervisor: Gemma Reynolds and Mark Coulson

Thank you for submitting your application. I can confirm that your application has been given approval from the date of this letter by the Psychology REC.

Please note the following:

1. Please ensure that you contact your supervisor/research ethics committee (REC) if any changes are made to the research project which could affect your ethics approval. There is an Amendment sub-form on MORE that can be completed and submitted to your REC for further review.
2. You must notify your supervisor/REC if there is a breach in data protection management or any issues that arise that may lead to a health and safety concern or conflict of interests.
3. If you require more time to complete your research, i.e., beyond the date specified in your application, please complete the Extension sub-form on MORE and submit it your REC for review.
4. Please quote the application number in any correspondence.
5. It is important that you retain this document as evidence of research ethics approval, as it may be required for submission to external bodies (e.g., NHS, grant awarding bodies) or as part of your research report, dissemination (e.g., journal articles) and data management plan.
6. Also, please forward any other information that would be helpful in enhancing our application form and procedures - please contact MOREsupport@mdx.ac.uk to provide feedback.

Good luck with your research.

Yours sincerely



Chair

Psychology REC

Study 2



Psychology REC

The Burroughs
Hendon
London NW4 4BT

Main Switchboard: 0208 411 5000

24/10/2018

APPLICATION NUMBER: 2016

Dear Karen Manville,

Re your application title: The effect of canine visitation therapy duration on enhancing student well-being

Thank you for submitting your application. I can confirm that your application has been given approval from the date of this letter by the Psychology REC.

Although your application has been approved, the reviewers of your application may have made some useful comments on your application. Please look at your online application again to check whether the reviewers have added any comments for you to look at.

Also, please note the following:

1. Please ensure that you contact your supervisor/research ethics committee (REC) if any changes are made to the research project which could affect your ethics approval. There is an Amendment sub-form on MORE that can be completed and submitted to your REC for further review.
2. You must notify your supervisor/REC if there is a breach in data protection management or any issues that arise that may lead to a health and safety concern or conflict of interests.
3. If you require more time to complete your research, i.e., beyond the date specified in your application, please complete the Extension sub-form on MORE and submit it your REC for review.
4. Please quote the application number in any correspondence.
5. It is important that you retain this document as evidence of research ethics approval, as it may be required for submission to external bodies (e.g., NHS, grant awarding bodies) or as part of your research report, dissemination (e.g., journal articles) and data management plan.
6. Also, please forward any other information that would be helpful in enhancing our application form and procedures - please contact MOREsupport@mdx.ac.uk to provide feedback.

Good luck with your research.

Yours sincerely,

Chair

Psychology REC



Study 3



Psychology REC

The Burroughs
Hendon
London NW4 4BT

Main Switchboard: 0208 411 5000

25/06/2019

APPLICATION NUMBER: 7916

Dear Karen Manville and all collaborators/co-investigators

Re your application title: Human canine interaction - quantitative - clinic/health

Supervisor: Gemma Reynolds Mark Coulson

Co-investigators/collaborators:

Thank you for submitting your application. I can confirm that your application has been given approval from the date of this letter by the Psychology REC.

Although your application has been approved, the reviewers of your application may have made some useful comments on your application. Please look at your online application again to check whether the reviewers have added any comments for you to look at.

Also, please note the following:

1. Please ensure that you contact your supervisor/research ethics committee (REC) if any changes are made to the research project which could affect your ethics approval. There is an Amendment sub-form on MORE that can be completed and submitted to your REC for further review.
2. You must notify your supervisor/REC if there is a breach in data protection management or any issues that arise that may lead to a health and safety concern or conflict of interests.
3. If you require more time to complete your research, i.e., beyond the date specified in your application, please complete the Extension sub-form on MORE and submit it your REC for review.
4. Please quote the application number in any correspondence.
5. It is important that you retain this document as evidence of research ethics approval, as it may be required for submission to external bodies (e.g., NHS, grant awarding bodies) or as part of your research report, dissemination (e.g., journal articles) and data management plan.
6. Also, please forward any other information that would be helpful in enhancing our application form and procedures - please contact MOREsupport@mdx.ac.uk to provide feedback.

Good luck with your research.

Yours sincerely



Chair

Psychology REC

Appendix C

Visual Analogue Scale - Anxiety, Stress, Depression

A - Anxiety

Please indicate your current level of anxiety.

Very anxious

Not at all anxious

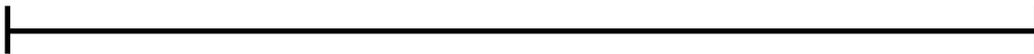


B - Stress

Please indicate your current level of stress.

Very stressed

Not at all stressed

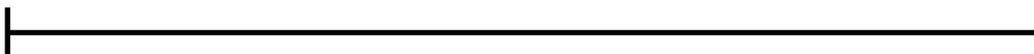


C- Depression

Please indicate your current level of depression.

Very depressed

Not at all depressed



Appendix D

Visual Analogue Scales - Well-being

The following questions ask how you feel on a scale from *very or low* to *not very or high*. Please indicate where on the line you feel best represents how you currently feel.

1. Optimism. How optimistic do you currently feel about your life in general?

Very optimistic

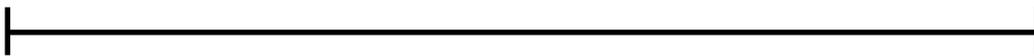
Not very optimistic



2. Confidence. How much confidence do you currently have in yourself?

Low confidence

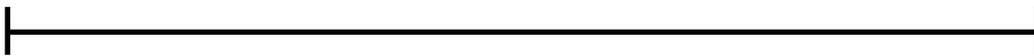
High confidence



3. Cheerfulness. How cheerful do you currently feel?

Very cheerful

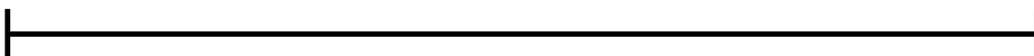
Not very cheerful



4. Relaxation. How relaxed do you currently feel?

Very relaxed

Not very relaxed



5. Feeling loved. How loved do you currently feel?

Very loved

Not very loved



Appendix E

Visual Analogue Scale - Canine Trait

1. Please indicate how cute you feel the canine is.

Very cute

Not at all cute



2. Please indicate how juvenile looking you feel the canine is

Very juvenile

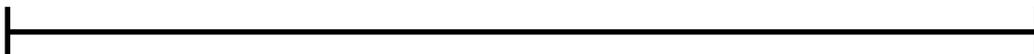
Not at all juvenile



3. Please indicate how adult looking you feel the canine is.

Very adult

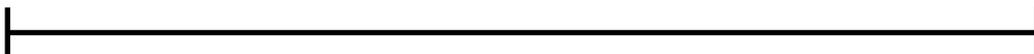
Not at all adult



4. Please indicate how friendly you feel the canine is.

Very friendly

Not at all friendly



5. Please indicate how loveable you feel Elvis is.

Very loveable

Not at all loveable



6. Please indicate how playful you feel the canine is.

Very playful

Not at all playful



7. Please indicate how good-natured you feel the canine is.

Very good natured

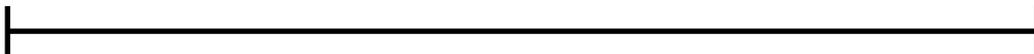
Not at all good natured



8. Please indicate how cuddly you feel the canine is.

Very cuddly

Not at all cuddly



Appendix F

The Depression, Anxiety, Stress Scale - 21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over **the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all

1 Applied to me to some degree, or some of the time

2 Applied to me to a considerable degree or a good part of time

3 Applied to me very much or most of the time

- | | | | | |
|--|---|---|---|---|
| 1. I found it hard to wind down | 0 | 1 | 2 | 3 |
| 2. I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| 3. I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| 4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| 5. I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |
| 6. I tended to over-react to situations | 0 | 1 | 2 | 3 |
| 7. I experienced trembling (e.g. in the hands) | 0 | 1 | 2 | 3 |
| 8. I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| 9. I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| 10. I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| 11. I found myself getting agitated | 0 | 1 | 2 | 3 |
| 12. I found it difficult to relax | 0 | 1 | 2 | 3 |

13. I felt down-hearted and blue	0	1	2	3
14. I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15. I felt I was close to panic	0	1	2	3
16. I was unable to become enthusiastic about anything	0	1	2	3
17. I felt I wasn't worth much as a person	0	1	2	3
18. I felt that I was rather touchy	0	1	2	3
19. I was aware of the action of my heart in the absence of physical exertion e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20. I felt scared without any good reason	0	1	2	3
21. I felt that life was meaningless	0	1	2	3

Appendix G

State Trait Anxiety Inventory

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

Not at all	Somewhat	Moderately so	Very much so
------------	----------	---------------	--------------

1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel Strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

Appendix H

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

	0 = Never	1= Almost Never	2 = Sometimes	3= Fairly Often	4 = Very Often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and “stressed”?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4

Appendix I

Becks Depression Inventory

For each question 1 through 21, please indicate with a tick, which best describes how you feel right now.

1.

- 0 I do not feel sad.
- 1 I feel sad.
- 2 I am sad all the time and I can't snap out of it.
- 3 I am so sad and unhappy that I can't stand it.

2.

- 0 I am not particularly discouraged about the future.
- 1 I feel discouraged about the future.
- 2 I feel I have nothing to look forward to.
- 3 I feel the future is hopeless and that things cannot improve.

3.

- 0 I do not feel like a failure.
- 1 I feel I have failed more than the average person.
- 2 As I look back on my life, all I can see is a lot of failures
- 3 I feel I am a complete failure as a person.

4.

- 0 I get as much satisfaction out of things as I used to.
- 1 I don't enjoy things the way I used to.
- 2 I don't get real satisfaction out of anything anymore.
- 3 I am dissatisfied or bored with everything.

5.

- 0 I don't feel particularly guilty.
- 1 I feel guilty a good part of the time.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6.

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7.

- 0 I don't feel disappointed in myself.
- 1 I am disappointed in myself.
- 2 I am disgusted with myself.
- 3 I hate myself.

8.

- 0 I don't feel I am any worse than anybody else.
- 1 I am critical of myself for my weaknesses or mistakes.
- 2 I blame myself all the time for my faults.
- 3 I blame myself for everything bad that happens.

9.

- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10.

- 0 I don't cry any more than usual.
- 1 I cry more now than I used to.
- 2 I cry all the time now.
- 3 I used to be able to cry, but now I can't cry even though I want to.

11.

- 0 I am no more irritated by things than I ever was.
- 1 I am slightly more irritated now than usual.
- 2 I am quite annoyed or irritated a good deal of the time.
- 3 I feel irritated all the time.

12.

- 0 I have not lost interest in other people.
- 1 I am less interested in other people than I used to be.
- 2 I have lost most of my interest in other people.
- 3 I have lost all of my interest in other people.

13.

- 0 I make decisions about as well as I ever could.
- 1 I put off making decisions more than I used to.
- 2 I have greater difficulty in making decisions more than I used to.
- 3 I can't make decisions at all anymore.

14.

- 0 I don't feel that I look any worse than I used to.
- 1 I am worried that I am looking old or unattractive.
- 2 I feel there are permanent changes in my appearance that make me look unattractive.
- 3 I believe that I look ugly.

15.

- 0 I can work about as well as before.
- 1 It takes an extra effort to get started at doing something.
- 2 I have to push myself very hard to do anything.
- 3 I can't do any work at all.

16.

- 0 I can sleep as well as usual.
- 1 I don't sleep as well as I used to.
- 2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
- 3 I wake up several hours earlier than I used to and cannot get back to sleep.

17.

- 0 I don't get more tired than usual.
- 1 I get tired more easily than I used to.
- 2 I get tired from doing almost anything.
- 3 I am too tired to do anything.

18.

- 0 I am too tired to do anything.
- 1 My appetite is no worse than usual.
- 2 My appetite is not as good as it used to be.
- 3 My appetite is much worse now. I have no appetite at all anymore.

19.

- 0 I haven't lost much weight, if any, lately.
- 1 I have lost more than five pounds.
- 2 I have lost more than ten pounds.
- 3 I have lost more than fifteen pounds.

20.

- 0 I am no more worried about my health than usual.
- 1 I am worried about physical problems like aches, pains, upset stomach, or constipation.
- 2 I am very worried about physical problems and it's hard to think of much else.
- 3 I am so worried about my physical problems that I cannot think of anything else.

21.

- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I have almost no interest in sex.
- 3 I have lost interest in sex completely.

Appendix J

Checklist Individual Strength

Instructions

You will find a number of statements below. With these statements we wish to get an impression of how you have felt during the past two weeks.

If you feel that this statement is true/ not true at all, please circle the number that best suite how you feel right now.

1. I feel tired

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

2. I feel very active

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

3. Thinking requires effort

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

4. Physically I feel exhausted

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

5. I feel like doing all kinds of nice things

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

6. I feel fit

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

7. I do quite a lot within a day

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

8. When I am doing something, I can concentrate quite well

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

9. I feel weak

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

10. I don't do much during the day

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

11. I can concentrate well

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

12. I feel rested

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

13. I have trouble concentrating

Yes, that is true 1 2 3 4 5 6 7 8 No, that is not true

14. Physically I feel I am in a bad condition

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

15. I am full of plans

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

16. I get tired very quickly

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

17. I have a low output

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

18. I feel no desire to do anything

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

19. My thoughts easily wander

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

20. Physically I feel in a good shape

Yes, that is true 1 2 3 4 5 6 7 8 **No, that is not true**

Appendix K

Ryff Scales of Psychological Well-Being

The following set of statements deals with how you might feel about yourself and your life. Please remember that there are neither right nor wrong answers.

Circle the number that best describes the degree to which you agree or disagree with each statement.	Strongly Disagree	Disagree	Disagree Slightly	Agree Slightly	Agree	Strongly Agree
1. Most people see me as loving and affectionate.	1	2	3	4	5	6
2. I am not afraid to voice my opinion, even when they are in opposition to the opinions of most people.	1	2	3	4	5	6
3. In general, I feel I am in charge of the situation in which I live.	1	2	3	4	5	6
4. I am not interested in activities that will expand my horizons.	1	2	3	4	5	6
5. I live life one day at a time and don't really think about the future.	1	2	3	4	5	6
6. When I look at the story of my life, I am pleased with how things have turned out.	1	2	3	4	5	6
7. Maintaining close relationships has been difficult and frustrating for me.	1	2	3	4	5	6
8. My decisions are not usually influenced by what everyone else is doing.	1	2	3	4	5	6
9. The demands of everyday life often get me down.	1	2	3	4	5	6
10. I don't want to try new ways of doing things—my life is fine the way it is.	1	2	3	4	5	6
11. I tend to focus on the present, because the future always brings me problems.	1	2	3	4	5	6
12. In general, I feel confident and positive about myself.	1	2	3	4	5	6
13. I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5	6
14. I tend to worry about what other people think of me.	1	2	3	4	5	6
15. I do not fit very well with the people and the community around me.	1	2	3	4	5	6
16. I think it is important to have new experiences that challenge how you think about yourself and the world.	1	2	3	4	5	6
17. My daily activities often seem trivial and unimportant to me.	1	2	3	4	5	6
18. I feel like many of the people I know have gotten more out of life than I have.	1	2	3	4	5	6
19. I enjoy personal and mutual conversations with family members or friends.	1	2	3	4	5	6
20. Being happy with myself is more important to me than having others approve of me.	1	2	3	4	5	6

Circle the number that best describes the degree to which you agree or disagree with each statement.	Strongly Disagree	Disagree	Disagree Slightly	Agree Slightly	Agree	Strongly Agree
21. I am quite good at managing the many responsibilities of my daily life.	1	2	3	4	5	6
22. When I think about it, I haven't really improved much as a person over the years.	1	2	3	4	5	6
23. I don't have a good sense of what it is I'm trying to accomplish in my life.	1	2	3	4	5	6
24. I like most aspects of my personality.	1	2	3	4	5	6
25. I don't have many people who want to listen when I need to talk.	1	2	3	4	5	6
26. I tend to be influenced by people with strong opinions.	1	2	3	4	5	6
27. I often feel overwhelmed by my responsibilities.	1	2	3	4	5	6
28. I have a sense that I have developed a lot as a person over time.	1	2	3	4	5	6
29. I used to set goals for myself, but that now seems a waste of time.	1	2	3	4	5	6
30. I made some mistakes in the past, but I feel that all in all everything has worked out for the best.	1	2	3	4	5	6
31. It seems to me that most other people have more friends than I do.	1	2	3	4	5	6
32. I have confidence in my opinions, even if they are contrary to the general consensus.	1	2	3	4	5	6
33. I generally do a good job of taking care of my personal finances and affairs.	1	2	3	4	5	6
34. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.	1	2	3	4	5	6
35. I enjoy making plans for the future and working to make them a reality.	1	2	3	4	5	6
36. In many ways, I feel disappointed about my achievements in my life.	1	2	3	4	5	6
37. People would describe me as a giving person, willing to share my time with others.	1	2	3	4	5	6
38. It's difficult for me to voice my own opinions on controversial matters.	1	2	3	4	5	6
39. I am good at juggling my time so that I can fit everything in that needs to be done.	1	2	3	4	5	6
40. For me, life has been a continuous process of learning, changing, and growth.	1	2	3	4	5	6
41. I am an active person in carrying out the plans I set for myself.	1	2	3	4	5	6
42. My attitude about myself is probably not as positive as most people feel about themselves.	1	2	3	4	5	6
43. I have not experienced many warm and trusting relationships with others.	1	2	3	4	5	6

Circle the number that best describes the degree to which you agree or disagree with each statement.	Strongly Disagree	Disagree	Disagree Slightly	Agree Slightly	Agree	Strongly Agree
44. I often change my mind about decisions if my friends or family disagree.	1	2	3	4	5	6
45. I have difficulty arranging my life in a way that is satisfying to me.	1	2	3	4	5	6
46. I gave up trying to make big improvements or change in my life a long time ago.	1	2	3	4	5	6
47. Some people wander aimlessly through life, but I am not one of them.	1	2	3	4	5	6
48. The past has its ups and downs, but in general, I wouldn't want to change it.	1	2	3	4	5	6
49. I know that I can trust my friends, and they know they can trust me.	1	2	3	4	5	6
50. I judge myself by what I think is important, not by the values of what others think is important.	1	2	3	4	5	6
51. I have been able to build a home and a lifestyle for myself that is much to my liking.	1	2	3	4	5	6
52. There is truth to the saying that you can't teach an old dog new tricks.	1	2	3	4	5	6
53. I sometimes feel as if I've done all there is to do in life.	1	2	3	4	5	6
54. When I compare myself to friends and acquaintances, it makes me feel good about who I am.	1	2	3	4	5	6

Appendix L

Warwick-Edinburgh Mental Well-being Scale

Below are some statements about feelings and thoughts.

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I feel optimistic about the future					
I feel useful					
I feeling relaxed					
I feel interested in other people					
I have energy to spare					
I deal with problems well					
I think clearly					
I feel good about myself					
I've been feeling close to other people					
I feel confident					
I am able to make up my own mind about things					
I feel loved					
I am interested in new things					
I feel cheerful					

Please tick (✓) the box that best describes how you currently feel about each statement.

Warwick-Edinburgh Mental Well-being Scale (WEMWBS) © NHS Health Scotland,
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Appendix M

Personal Wellbeing Index

The following questions ask how satisfied you feel. Please indicate on the scale where best represents how you **currently** feel.

1. Thinking about your own life and personal circumstances, how satisfied are you **with your life as a whole ? OPTIONAL**

No satisfaction at all

Completely satisfied



2. How satisfied are you **with your standard of living?**

No satisfaction at all

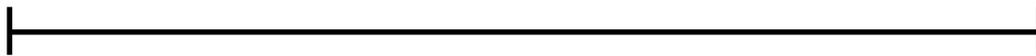
Completely satisfied



3. How satisfied are you **with your health?**

No satisfaction at all

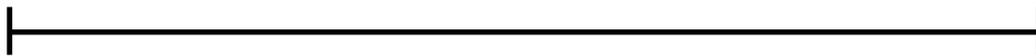
Completely satisfied



4. How satisfied are you **with what you are achieving in life?**

No satisfaction at all

Completely satisfied



5. How satisfied are you **with your personal relationships?**

No satisfaction at all

Completely satisfied



6. How satisfied are you **with how safe you feel?**

No satisfaction at all

Completely satisfied



7. How satisfied are you **with feeling part of your community?**

No satisfaction at all

Completely satisfied



8. How satisfied are you **with your future security?**

No satisfaction at all

Completely satisfied

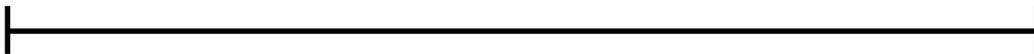


Optional question

9. How satisfied are you **with your spirituality or religion?**

No satisfaction at all

Completely satisfied



Appendix N

Vulnerable Attachment Style Questionnaire

FEELINGS ABOUT RELATIONSHIPS (VASQ)

Below are a number of statements concerning the way people feel about themselves in relation to others. Indicate whether you agree or disagree with the description as it applies to you by selecting the answer that applies to you.

	Strongly Agree	Agree	Unsure	Disagree	Strongly disagree
1. I take my time getting to know people.					
2. I rely on others to help me make decisions in life					
3. People let me down a lot					
4. I miss the company of others when I'm alone					
5. Its best not to get too emotionally close to other people					
6. I worry a lot if people I live with arrive back later than expected					
7. I usually rely on advice from others when I've got a problem					
8. I feel uncomfortable when people get too close to me					
9. People close to me often get on my nerves					
10. I feel people are against me					
11. I worry about things happening to close family and friends					
12. I often get into arguments					
13. I'm clingy with others					
14. I look forward to spending time on my own					
15. I like making decisions on my own					
16. I get anxious when people close to me are away					
17. I feel uneasy when others confide in me					
18. I find it hard to trust others					
19 Having people around me can be a nuisance					
20. I feel people haven't done enough for me					
21. Its important to have people around me a lot of the time					
22. I find it difficult to confide in people					

30/5/19, Version 1