Patients' Perception of Animal-Assisted Psychotherapy Incorporating Mindfulness and

Self-Compassion in Neurorehabilitation:

A Qualitative Content Analysis

Sarah Kuhn

Matrikel-Nr. 03-716-446

Supervisor

M. Sc. Pascale Künzi

Reviewer

Prof. Dr. Martin grosse Holtforth

Bern, 22.10.2022

University of Bern

Faculty of Psychology

Division of Clinical Psychology and Psychotherapy

Abstract

Animal assistance is thought to increase the efficacy of psychotherapeutic approaches used in neurorehabilitation. The present study investigates the patients' perception of a psychotherapeutic mindfulness- and self-compassion-based group intervention (MSCBI) with ($n = 11$) and without ($n = 8$) animal assistance for patients with acquired brain injury. Through a qualitative content analysis of follow-up interviews, 25 categories were developed inductively. Overall, patients in the animal-assisted MSCBI group recalled more exercises and had less difficulty remembering the intervention. Compared to the patients of the standard MSCBI, patients in the animal-assisted MSCBI were more likely to report continued practice and positive changes in mindfulness, self-compassion, and daily life. Patients in the animal-assisted MSCBI also more frequently mentioned feeling connected to the therapy group, having a positive interaction with the therapist, and having involved their family. In contrast, patients of the standard MSCBI talked more frequently about the acquired brain injury and associated limitations. In the animal-assisted MSCBI the most frequently named category related to animals was "positive emotions through animal", followed by "interaction with animal", "animal as a model", and "peace and relaxation through animal". Findings and implications for further research are discussed.

Keywords: animal-assisted therapy, neurorehabilitation, acquired brain injury, memory, positive emotions, connectedness, mindfulness, self-compassion

Introduction

Acquired brain injuries are a global health issue. In Europe every year 50–60 million people suffer a traumatic brain injury (Brazinova et al., 2021), and worldwide over 100 million have a stroke (Feigin et al., 2022). Whether it is a traumatic or non-traumatic brain injury, for those affected, it is generally a shock. They experience a loss of control and independence, and their life can change inexorably from one moment to the next. Thus, it is not surprising that after an incident, many patients show psychological difficulties such as depressive or anxiety symptoms, and posttraumatic stress disorder (PTSD) (Eliasen et al., 2021; Fakhoury et al., 2021; Medeiros et al., 2020). The incidence of depression within one year after stroke ranges from 18% to 33% (Medeiros et al., 2020) and is associated with higher mortality (Bartoli et al., 2018). Comorbid depression (Blöchl et al., 2019) and PTDS symptoms (Sydnor et al., 2020) negatively influence neurorehabilitation outcomes. Depending on the location of the lesion, the brain damage itself may promote the development or persistence of depression (Fakhoury et al., 2021; Guo et al., 2022) or posttraumatic stress disorder (PTSD) (Sydnor et al., 2020).

Psychotherapy can help patients break the vicious cycle, adapt to brain injury and its consequences, and regain well-being and quality of life. In recent years, several psychotherapeutic interventions have been explored and developed for patients who have suffered from an acquired brain injury. Examples of these include cognitive behavioral therapy, acceptance and commitment therapy, compassion-focused therapy, positive psychology, and attachment-based psychotherapy (Yeates & Ashworth, 2019). Current studies also suggest that holistic approaches such as music therapy (Mishra et al., 2021) or Tai Chi (Yeates et al., 2022) can help patients with acquired brain injury. Therapeutic approaches including mindfulness and self-compassion have also shown promise for patients with acquired brain injury (Künzi et al., 2022). Mindfulness-based therapy is known to decrease symptoms of depression and anxiety (Strauss et al., 2014), and chronic pain (Hilton et al., 2017). Mindfulness practice has also been proven to be useful for the treatment of comorbid psychological disturbances in patients with serious physical illnesses, such as cancer (Carlson & Garland, 2005) or acquired brain injury (Acabchuk et al., 2021). According to Neff (2003) mindfulness is an integral part of self-compassion. That is because self-compassion involves three components, each having opposite poles of a continuum: self-kindness versus self-judgment, mindfulness versus over-identification, and common humanity versus isolation (Neff, 2003). Self-compassion-based training indicates remarkable outcomes as well. Research shows that there is a negative association between self-

compassion and depression and anxiety in patients with chronic physical illnesses (Hughes et al., 2021). Self-compassion-based programs effectively promote self-compassion and decrease anxiety, depressive symptoms, and psychopathology in clinical and subclinical populations (Wilson et al., 2019). There is also evidence that self-compassion and PTSD symptomatology are negatively related to each other (Winders et al., 2020), and interventions based on self-compassion (Luo et al., 2021; Wilson et al., 2019) and mindfulness (Taylor et al., 2020) can reduce symptoms of PTSD. These results are consistent with Gilbert's theory of affect regulation where self-compassion targets the soothing system. Based on evolutionary, developmental, and neuroscience perspectives Gilbert (2014) describes three interacting systems that are required for our survival: the threat system, the drive system, and the soothing system. According to Gilbert (2014), the threat system is a fight-flight system focused on detecting and protecting oneself from threats. It is associated with fear, anger, and disgust. The drive system on the other hand fulfills essential needs through motivation and pleasure. It is associated with determination, focus, ambition, and desire. The soothing system finally is related to affection, protection, trust, and satisfaction. It focuses on attachment- and relationship-related factors which are regarded as being essential in the development and perseverance of symptoms of PTSD (Marshall & Frazier, 2019; Woodhouse et al., 2015).

Animal assistance effectively complements traditional psychotherapeutic or third-wave approaches (Allen et al., 2022; Eaton-Stull et al., 2021; Schramm et al., 2015, 2022). It has been shown that patients suffering from depression (Ambrosi et al., 2019), or PTSD (Hediger et al., 2021) can be helped with animal-assisted therapy. Current research shows promising results of animal-assisted therapy even in cases of complex PTSD such as war trauma (Fonseka et al., 2022), or interpersonal and early trauma (Allen et al., 2022; Schramm et al., 2022). Furthermore, engaging an animal in the classroom supports social skills and reduces problem behaviors in children (O'Haire et al., 2013; Wintermantel & Grove, 2022). The presence and interaction with a dog in the classroom also seem to have a positive impact on children's learning, attention, and concentration (Hediger & Turner, 2014; Reilly et al., 2020).

In neurorehabilitation, the value of animal-assisted therapy is increasingly appreciated. Animal-assisted therapy promotes aspects of social behaviors and communication and leads to better mood, higher motivation, and satisfaction in patients with acquired brain injury (Hediger et al., 2019). Beneficial effects of animal-assisted therapy in patients suffering from neurological impairment were also found about episodic memory

(Theis et al., 2020), concentration and alertness (Gocheva et al., 2018; Hediger, Petignat, et al., 2019), relaxation and having fun (Hediger et al., 2020), and the feelings of safety, comfort, motivation, gratefulness, acceptance, and ease (Künzi et al., 2022).

Although there is evidence of animal support in psychotherapy, little research has been conducted on animal-assisted therapy's many applications and modes of action. The present study examined patients' perception of an injury-adapted psychotherapeutic group intervention based on mindfulness and self-compassion (MSCBI) with and without animal assistance for patients with acquired brain injury. The aim of this study is to gain greater knowledge and a deeper insight into the impact of animal-assisted therapy and develop suggestions for future research.

Methods

Study Design

We conducted a qualitative content analysis of semi-structured follow-up interviews, which were part of a broader study (Künzi et al., 2022).

Participants and Procedure

Nineteen neurorehabilitation patients diagnosed with an acquired brain injury completed the follow-up interview of a randomized controlled study in 2019. The study of Künzi and colleagues (2022) was conducted at a neurorehabilitation clinic in Switzerland. Thirty-one patients were originally included and met the following criteria: (a) inpatient of REHAB Basel, (b) diagnosed with an acquired brain injury, (c) achieve a score of ≥ 20 in the Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005), (d) experiencing depressive and/or anxiety symptoms and or/problems with psychological adaption to the injury, (e) willing to work with animals, and (f) German-speaking. The patients were randomly assigned to either the group with animal assistance (AA-MSCBI; $n = 14$) or the group without animal assistance (MSCBI; $n = 17$). The randomization was stratified by cognitive status (MoCA-Score) and age. According to the authors, one of the patients in the standard MSCBI dropped out before starting the intervention. Over the intervention, one dropout in the animal-assisted MSCBI and four in the standard MSCBI were recorded. A total of 19 completers participated in the follow-up interview (AA-MSCBI: $n = 11$; MSCBI: $n = 8$).

Onwuegbuzie and Leech (2007) recommend a sample size of 15 to 20 for qualitative analysis of semi-structured interviews. Therefore, a sample of 19 interviews seems adequate.

However, it must be noted that the sample size in qualitative studies is still a subject of lively debate in research (Mayring, 2021).

Intervention

All patients received a psychotherapeutic mindfulness- and self-compassion-based intervention (MSCBI). The MSCBI included elements of Mindfulness-based Compassionate Living (MBCL) (van den Brink % Koster, 2015), Mindfulness-based Stress Reduction (MBSR) (Kabat-Zinn, 2013), Mindfulness-based Cognitive Therapy (MBCT) (Segal et al., 2018), and was supplemented with relational mindfulness- and attachment-focused aspects. The intervention was adapted to the specific problems of patients suffering from acquired brain injury (Künzi et al., 2022) and lasted six weeks with two weekly sessions, resulting in 12 sessions per patient. The standard MSCBI was held by four psychotherapists with training in mindfulness- and self-compassion-based techniques. Except for the walking exercises, the sessions took place inside a room in the clinic. The animal-assisted MSCBI was led by two psychotherapists with a certificate in animal-assisted therapy and training in mindfulness- and self-compassion-based techniques. Sessions were held outdoors or in a room close to the stable. The involved animals in therapy were horses, a mule, minipigs, goats, and sheep. Further and more detailed information is reported in the study of Künzi and colleagues (2022)

Measures

The follow-up interview at week 11 was conducted with 19 patients who completed the study. Appendix A shows that the semi-structured interview included nine open-ended questions addressing the patients' memories, experiences, changes, and challenges in relation to the study. Other measures have been published separately (Künzi et al., 2022).

Qualitative Content Analysis

The interview material has been analyzed using qualitative content analysis according to Mayring (2021). We transcribed the 19 audiotaped interviews and added them to the software program QCAmap. The interviews ranged in length, from 75 words up to 3893 words with a mean of 1200 words ($SD = 1174$). On average, the interviews of the animal-assisted condition (1558 words, $SD = 1338$) were twice as long as the interviews of the active control group (708 words, $SD = 712$).

We developed the category system inductively by coding manifest contents. Coded were sentences, sequences of sentences, sequences of words, and single words. We counted multiple statements, but not numerous recalls of a specific exercise within an interview question. In addition, we decided not to code responses to interview question number six, because it was apparent that the answers were partly due to social desirability. We also did

not count statements following an additional input of an interviewer, which occurred a few times in both conditions. After coding 50% of the material, the categories were revised.

Once the material was coded entirely, two researchers discussed each category and coding until a consensus was reached. In addition, one researcher coded all of the material a second time after six weeks to test the discrepancies between the first and second coding process, respectively the stability of the developed system (Mayring, 2021). We adapted and modified the category system by merging categories where there were not enough codings, such as "intervention too short" or "intervention as duty" to "dissatisfaction organizational aspects". In addition, we deleted categories whose content was not directly related to the research questions such as "premorbid experiences with meditation" or "premorbid experiences with animals".

To examine interrater reliability, an independent student from another university coded all the material. Based on the final category system with 25 categories, the student was trained by coding four of the 19 interviews together with the first coder. Given the nominal data and the two coders, we decided to calculate Cohen's Kappa. We solved the problem of having coded not only whole sentences but also word sequences and single words by setting 1 for coding the a specific category and 0 for coding another category. This procedure resulted in a mean *Cohen's Kappa* of 0.95 (range 0.83 to.1.00), indicating an excellent agreement.

Findings

Sample Characteristics

Table 1 presents the baseline demographics and sample characteristics of the patients who participated in the follow-up interview. The baseline demographics and characteristics did not differ significantly between the two groups.

Table 1

Baseline Demographics and Sample Characteristics

	AA-MSCBI ($n = 11$)	MSCBI ($n = 8$)	Statistics
Age			
Age in years, M (range)	41.91 (26 – 66)	47.88 (27 – 64)	*Difference* = 5.97, CI = -7.09 to 19.02, $p = 0.35$
Gender, N (%)			
Male	7 (63.6)	7 (87.5)	

	AA-MSCBI (n = 11)	MSCBI (n = 8)	Statistics
Female	4 (36.4)	1 (12.5)	*Difference* = 0.24, CI = -0.65 to 0.18, *p* = 0.24
Marital status, *N* (%)			
Single/living alone	6 (54.5)	5 (62.5)	*Difference* = 0.08, CI = -0.59 to 0.43, *p* = 0.75
Married/living together	5 (45.5)	3 (37.5)	
Highest education, *N* (%)			
Basic (compulsory and secondary school/apprenticeship)	4 (36.4)	6 (75.0)	*Difference* = 0.39, CI = -0.87 to 0.09, *p* = 0.11
Secondary (college/university)	7 (63.6)	2 (25.0)	
Premorbid psychological difficulties, *N* (%)			
Yes	3 (27.3)	2 (25.0)	*Difference* = 0.02, CI = -0.43 to 0.48, *p* = 0.92
No	8 (72.7)	6 (75.0)	
Psychological treatment, *N* (%)			
Current	6 (60.0)	4 (50.0)	*Difference* = 0.28, CI = -0.64 to 1.19, *p* = 0.53
Past	2 (20.0)	1 (12.5)	
Current and past	2 (20.0)	3 (37.5)	
Not specified, missing [a]	1	0	
Rehabilitation setting, *N* (%)			
Residential	7 (63.6)	6 (75.0)	*Difference* = 0.11, CI = -0.59 to 0.37, *p* = 0.62
Semi-residential/ambulant	4 (36.4)	2 (25.0)	
Diagnosis, *N* (%)			
TBI	5 (45.5)	4 (50.0)	*Difference* = 0.05, CI = -0.56 to 0.47, *p* = 0.86
Non-TBI	6 (54.5)	4 (50.0)	
Time			
Time since injury (month), *M (SD)*	4.09 (2.17)	4.38 (2.45)	*Difference* = 0.28, CI = -1.96 to 2.52, *p* = 0.79
Cognitive impairment			
MoCA, *M (SD)*	25.09 (2.51)	24.38 (2.33)	*Difference* = 0.72, CI = -3.10 to 1.67, *p* = 0.54
Psychological characteristics			
GSI pre-treatment, *M (SD)*	0.65 (0.50)	0.29 (0.21)	*Difference* = 0.36, CI = -0.72 to 0.01, *p* = 0.053
Affection for animals, *M (SD)*	5.82 (0.41)	4.87 (0.99)	*Difference* = 0.94, CI = -1.64 to -0.25, *p* = 0.11
Owner of a pet, *N* (%)			
Yes	5 (45.5)	4 (50.0)	

	AA-MSCBI (n = 11)	MSCBI (n = 8)	Statistics
No	6 (54.5)	4 (50.0)	*Difference* = 0.05, CI = -0.56 to 0.47, *p* = 0.86

Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention; *N* = number of patients. *%* = percentage of patients; *M* = mean; *SD* = standard deviation. *TBI* = traumatic brain injury; *Non-TBI* = non-traumatic brain injury; *MoCA* = Montreal Cognitive Assessment; *GSI* = Global Severity Index of the Brief Symptom Inventory reflexing patients' general psychological distress; [a] = not included in analysis.

Categories

Table 2 gives an oversight of the 25 categories which were developed inductively and summarized in the five main categories "Exercises", "Interpersonal context", "Changes", "Challenges", and "Animals". The interviews of the animal-assisted MSCBI and the standard MSCBI differed in the frequencies with which categories were mentioned. Table 3 compares both conditions within the entire category system and the counted frequencies.

Table 2

Inductively Developed Categories, Selection Criteria and Examples of Each Category

Category	Selection Criteria	Examples
Exercises		
Mindfulness exercise	Remembers a specific mindfulness exercise or the mindfulness exercises in general.	• "We always did a listening meditation at the beginning, or we always listened to what was going on in the outside world." • "Then that with the senses, the hearing, smelling, … then with the tapping." • "Then the body scan." • "The leading of each other's hands without communication."
Self-compassion exercise	Remembers a specific self-compassion exercise or the self-compassion exercise in general.	• "… and not trying to beat yourself up." • "… paying attention to yourself and maybe thinking about what's going on or how you feel."

Category	Selection Criteria	Examples
Exercises in general	Remembers specific sequences of the sessions. Or remembers concepts and theories. Or remembers the exercise material. Or remembers the stimulation story. Recall does not include elements of • Mindfulness exercise • Self-compassion exercise • Exercise with animals	• "It has always been a quiet welcome, an arrival…" • "I can't reproduce everything, but there is a sheet in the folder…" • "Yes, Dropbox, we were given the opportunity to download it. Then you can listen to it again on your iPhone or at home on your computer." • "And then there was one extreme impression that the story left on me, and that was the one with the coffee beans."
Exercise with animals	Recalls a specific exercise with animals or the exercises with the animals in general.	• "With the goats, we have been outside, and I think put food on the ground." • "Where we once walked with the horses in a circle, and then with the rope, once left long and then left short, very short and then so middle and then the perception, what do I feel or how did I feel, how do I perceive myself, how do I perceive the horse, how do I perceive us, how is it better for him, for me, for both." • "It's been the first time I got to work so intensively with animals, and with different animals."
Interpersonal context		
Connectedness therapy group	Remembers feeling being part of the therapy group. And/or remembers feeling accepted and valued by therapy group and fellow patients. And/or reports a good atmosphere in the therapy group.	• "The feeling of being in a group and share even the worst things, so just not to be alone." • "I think, we've grown pretty close as well." • "I felt well understood in a difficult moment." • "And also, for example, this calmness that has always been there or this atmosphere somehow."
Interaction with therapist	Recalls a personal interaction with a therapist and/or positive influential impressions of therapists.	• "Afterward, Mrs. P. came and calmed me down so much."

Category	Selection Criteria	Examples
		• "And also Mrs. K., who really gave such calm and security, I will never forget that." • "I also told Mrs. K. about this app."
Involving family	Has involved family or friends in therapy by sharing experiences and knowledge.	• "When I came home and said I had walked with sheep, of course everyone had to laugh." • "When I told them at home what we had experienced, … no one laughed at me, on contrary, they thought it was cool." • "It had quite an effect on my mother. She found it totally interesting… I left the folder on the kitchen table, and she read it and found it really great, and it's something that we always talk about together."
Fellow patient	Remembers a specific fellow patient. Recall does not include elements of • Connectedness therapy group	• "He's a horse fan, after all, and you could really see there that he was one with the horses." • "The information from the participants had been interesting for me, like the emotional world of different patients"
Changes		
Change within session	Recalls positive change within sessions.	• "I can still remember the listening meditation and how my perception changed as well." • "A lot of times I've gone in with… been nervous or had anxiety or something, and always come out of there positive, at ease."
Change over intervention	Recalls a positive change during the intervention.	• "After the first two sessions I thought, this is not for me at all, and then I didn't really feel like it. But after that I have to say, I appreciated it very much." • "In the beginning, a bit of duty because I was already outside. But afterwards, pleasantly important."

Category	Selection Criteria	Examples
Change mindfulness	Self-perceived positive change in mindfulness since the intervention.	• "Just being a little more mindful of yourself…" • "I would say this study has just brought me back a little bit of serenity." • "I can somehow better keep my distance from unpleasant situations. I can categorize them as they are. They are there, but sometimes you just can't change it. Then you shouldn't get terribly upset about it but find a solution that is feasible."
Change self-compassion	Self-perceived positive change in self-compassion since the intervention.	• "I'm being friendlier with myself." • "And I think, I can also deal with myself a little better this way, more patiently." • "Simply that you pay a little more attention to yourself and give yourself time and rest."
Change daily life	Self-perceived positive change in feeling, behavior, and/or attitudes since the intervention. The recall does not include elements of • Change within session • Change over intervention • Change mindfulness • Change self-compassion • Continued practicing	• "In the meantime, I am much, much more alive. I can mingle with people and participate in life." • "… That you can get something positive out of it and take the beautiful things in your heat. And can refresh yourself on those, … This I had before, but. Not yet as felt pronounced as thanks to this study." • "That you are basically in a better mood."
Continued practicing	Has continued to practice mindfulness and/or self-compassion after the rehab stay. And/or regularly recalls valuable inputs since the end of the intervention.	• "The breathing technique I still need quite often." • "And listening meditation, the perception of sounds, I also try to use that every now and then." • "I also did that with the coffee beans."
No change	Has not noticed any changes since the intervention.	• "… but that it should still have an effect on me now, that's difficult to believe."

Category	Selection Criteria	Examples
Not continued practicing	Did not continue to practice mindfulness and/or self-compassion after the intervention.	• "No, I haven't done anything, I have to be honest."
Challenges		
Acquired brain injury	Talks about the brain injury and/or related difficulties such as limitations, symptoms, stresses, examinations, and therapies. And/or struggles with fate. And/or remembers past illnesses or injuries.	• When they said brain tumor, I thought, okay, that's it, ciao life." • "Staying at the rehab is not exactly what I had in mind for 2018." • "… I imagined it would be easier to get back into the daily routine."
Dissatisfaction organizational aspects	Reports difficulties or expresses critic or regret regarding context and/or conditions of the intervention.	• "Mrs. K. had a dropbox and with that I was totally overwhelmed at the beginning." • "In the end it really became a duty for me…" • "The cold room sometimes… it was too cold for me sometimes…"
No memory	Does not remember.	• "We did a lot, that's all I can remember."
Animals		
Positive emotion through animal	Had or has positive emotions through contact with animals within the intervention.	• "I like goats so much; it made me feel so happy afterward." • "And I think that's been the most beautiful moment I've had." • "The goats were fun too. They're relatively smart… laughs." • "… all the images come in my mind now, what I have experienced. And it's a very happy feeling, very beneficial."
Interaction with animal	Recalls a personal interaction with a specific animal of the rehab. Or makes a comment about the human-animal relationship in general.	• "So, I do very fondly think back to the moments I spent with Cindy, with the mule. I was very comfortable with her and very attracted to her and spent much time petting her and grooming her." • "The second time I had the feeling that the one horse – it is now a bit conceited – had recognized me and then came with the head so a bit trusting."

Category	Selection Criteria	Examples
		• "Yes, I think in general a better understanding of animals in such a small animal zoo. And how to behave towards mini pigs."
Animal as model	Aspects of model learning. E.G., transfers behavior or perceived experiences of animals to self or other people.	• "I'm doing exactly what I don't want to do to this goat, which I don't like myself either." • "Where we were outside with the pigs and looked at what effects stress has." • "That's impressive with the animals, how they can behave with each other and bash each other's heads in, bambam, and then they run apart again, and then it's forgotten again. So not resentful at all and how quickly that happens with animals."
Peace and relaxation through animal	Has found peace and/or relaxation through the animals within the intervention and/or the exercise with the animals.	• "Yes, for me all the interactions with the animals were very enjoyable and relaxing." • "And it certainly gave a certain calmness, mainly because we were working with the animals at that time." • "Like in therapy, you get a horse, and then you're off and walking. And so, one just came to calm."
Animals at the Rehab	Remembers the animals of the rehab in general. Recall does not include elements of: • Positive emotion related to animal • Interaction with animal • Animal as model • Peace and relaxation through animal • Exercise with animals	• "I remember all the animals." • "The animals of course, which were around us all the time." • "The goats and chickens too."
Nature	Remembers being outside and/or has enjoyed nature within the intervention.	• "Then you got outside for a change." • "Doing something outside, being outside, could also be taken as a positive situation."

Table 3

Overview of the Entire Category System and the Counted Frequencies

Category	AA-MSCBI (*n* = 11)			MSCBI (*n* = 8)		
	Absolute Count	N of Patients	% of Patients	Absolute Count	N of Patients	% of Patients
Exercises						
Mindfulness exercise	38	9	82	32	6	75
Self-compassion exercise	2	2	18	2	1	13
Exercises in general	10	6	55	7	4	50
Exercise with animals	69	11	100	0	0	0
Interpersonal context						
Connectedness therapy group	24	9	82	3	2	25
Interaction with therapist	13	7	64	2	2	25
Involving family	18	7	64	6	4	50
Fellow patient	7	4	36	7	3	38
Changes						
Change within session	4	3	27	2	1	13
Change over intervention	4	3	27	0	0	0
Change mindfulness	18	7	64	4	3	38
Change self-compassion	9	5	46	2	2	25
Change daily life	21	7	64	2	2	25
Continued practicing	28	10	91	7	3	38
No change	2	2	18	3	3	38
Not continued practicing	1	1	9	3	3	38
Challenges						
Acquired brain injury	16	6	55	24	4	50
Dissatisfaction organizational aspects	12	6	55	8	4	50
No memory	0	0	0	7	4	50
Animals						
Positive emotion through animal	32	10	91	0	0	0
Interaction with animal	14	5	46	0	0	0
Animal as model	11	4	36	0	0	0
Peace and relaxation through animal	7	5	46	0	0	0
Animals at the Rehab	9	6	55	0	0	0
Nature	7	3	27	0	0	0
Total	376			121		

Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention; *Absolut Count* = absolute frequency; *N of Patients* =

number of patients who made a statement; *% of Patients* = percentage of patients who made a statement.

Exercises

Patients of both groups mentioned mindfulness- and self-compassion-based exercises at about the same frequency. Patients in the animal-assisted MSCBI recalled animal-assisted exercises just as often and, thus, twice as many exercises overall (see Figure 1). As shown in Table 3, every patient in the animal-assisted MSCBI recalled at least one animal-assisted exercise, whereas mindfulness- and self-compassion-based exercises in both groups were not recalled by every patient.

Figure 1

Recalled Exercises
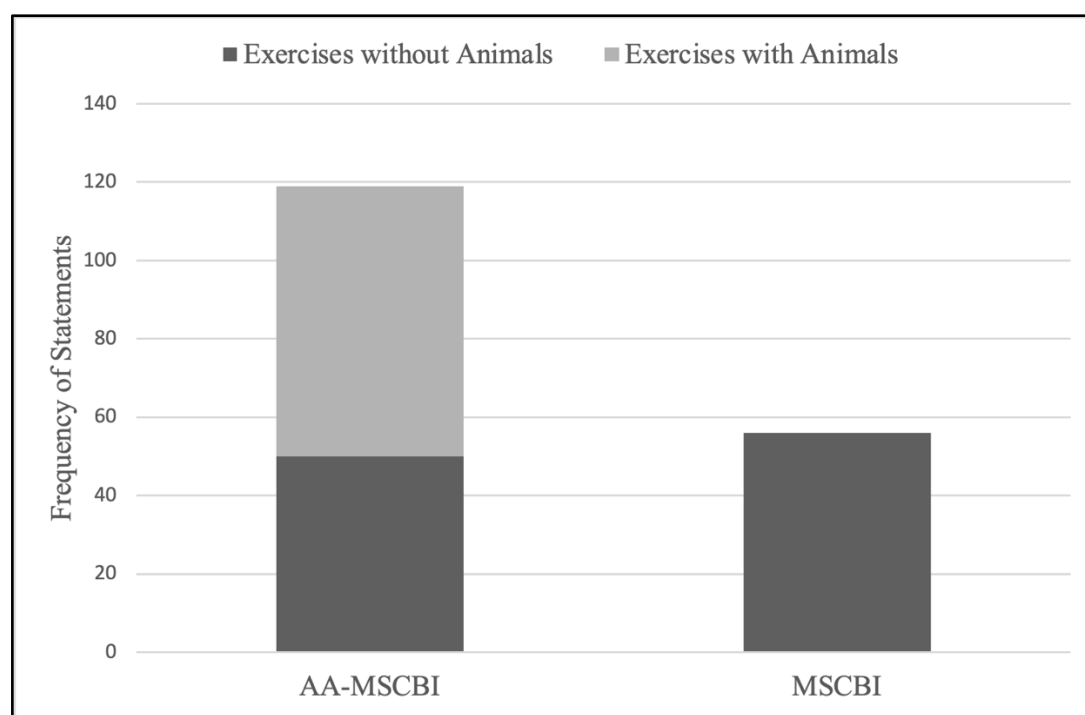
Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention; *Exercises without Animals* = categories "mindfulness exercises", "self-compassion exercises", and "exercises in general". For this figure, the frequency of the standard MSCBI group ($n = 8$) was extrapolated to the sample size of the AA-MSCBI group ($n = 11$).

Interpersonal Context

As shown in Figure 2, memories of or experiences with people involved in the study differed between the patients of the two conditions. Patients in the animal-assisted MSCBI

were likelier to report a sense of connection with the therapy group. Over 80% of the patients in the AA-MSCBI said that they felt connected with the therapy group, accepted by the therapy group, or appreciated the atmosphere in the therapy group. In contrast, only 25% of the standard MSCBI felt this way (see Table 3). Patients in the animal-assisted MSCBI also talked more frequently about personal interaction with a therapist or involving their families, for instance, by telling them about their experiences with the animals.
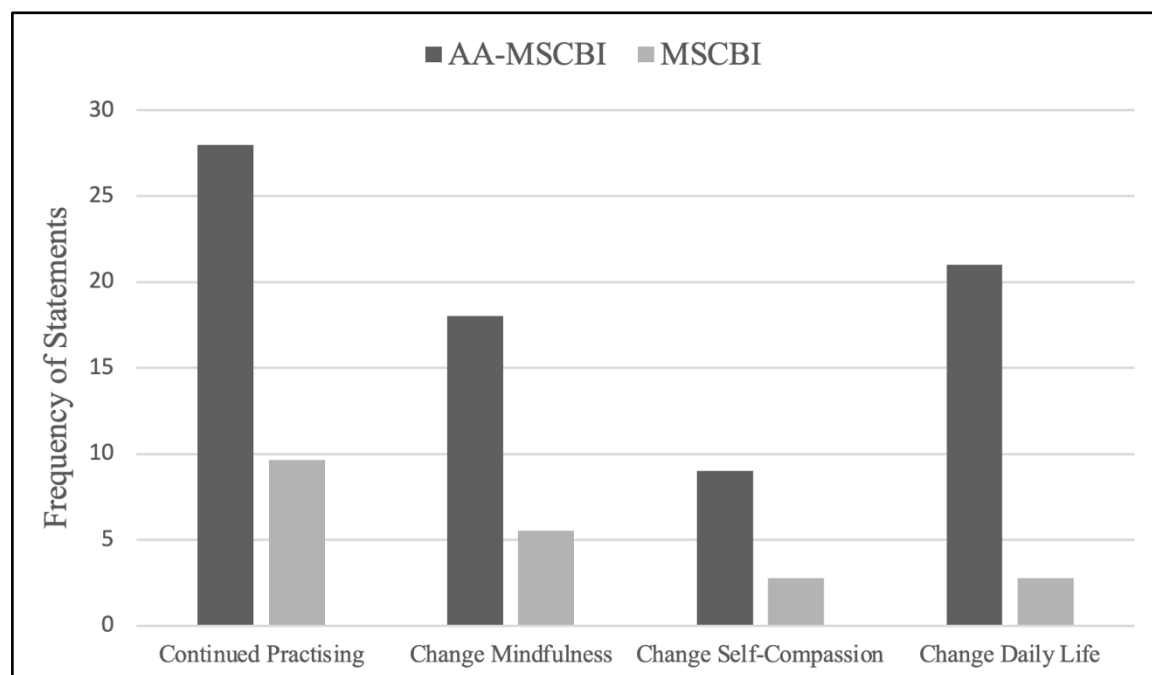
Figure 2

Social Connection
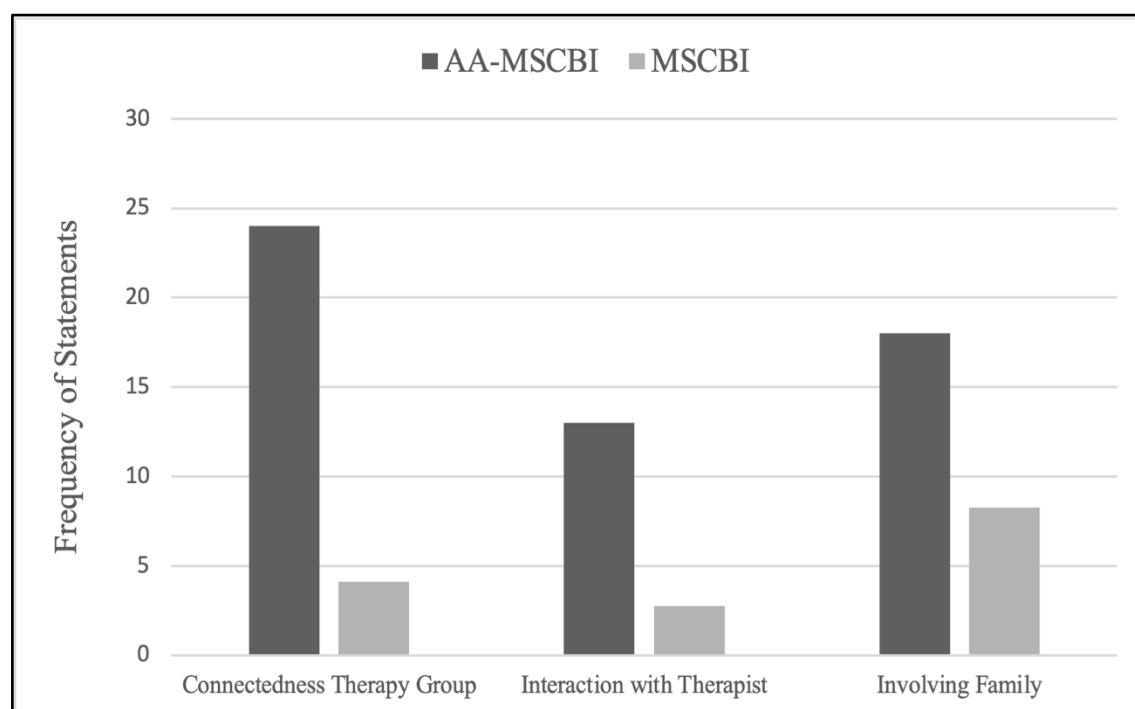
Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention. For this figure, the frequency of the standard MSCBI group ($n = 8$) was extrapolated to the sample size of the AA-MSCBI group ($n = 11$).

Changes

As shown in Figure 3, patients in the animal-assisted MSCBI were more likely to report having continued mindfulness- and self-compassion practice after the intervention than patients in the standard MSCBI. In the animal-assisted MSCBI 91% of the patients reported at least once having continued practicing after rehab. In contrast, only 38% of the patients in the standard MSCBI did (see Table 3). Furthermore, patients in the animal-assisted MSCBI mentioned more changes in mindfulness, self-compassion, and aspects of daily life than those in the standard MSCBI.

Figure 3

Continued Practicing and Changes

Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention. For this figure, the frequency of the standard MSCBI group ($n = 8$) was extrapolated to the sample size of the AA-MSCBI group ($n = 11$).

Challenges

As shown in Figure 4, patients in the animal-assisted MSCBI spoke less about their acquired brain injury and associated limitations. Both groups mentioned dissatisfaction and difficulties with the external conditions and terms of the intervention with similar frequency. Most of the reported problems with organizational aspects might be related to the acquired brain injury, such as difficulties finding the building, finding the walk to the facility too long, finding the room too cold, having troubles with data storage, finding it difficult to read the questionnaires, perceiving the noise from the street as too loud, and lack of concentration. Apart from this, one patient with the standard MSCBI felt that the study was an unpleasant duty, and one patient in the animal-assisted MSCBI mentioned difficulties with a pig. One patient of each condition found the study too short and would have liked to continue. Table 3 shows that 50% of the patients of the standard MSCBI answered at least once they could not remember. In contrast, none of the animal-assisted MSCBI patients reported difficulties remembering the exercises or contents of the study.

Figure 4

Challenges and Difficulties
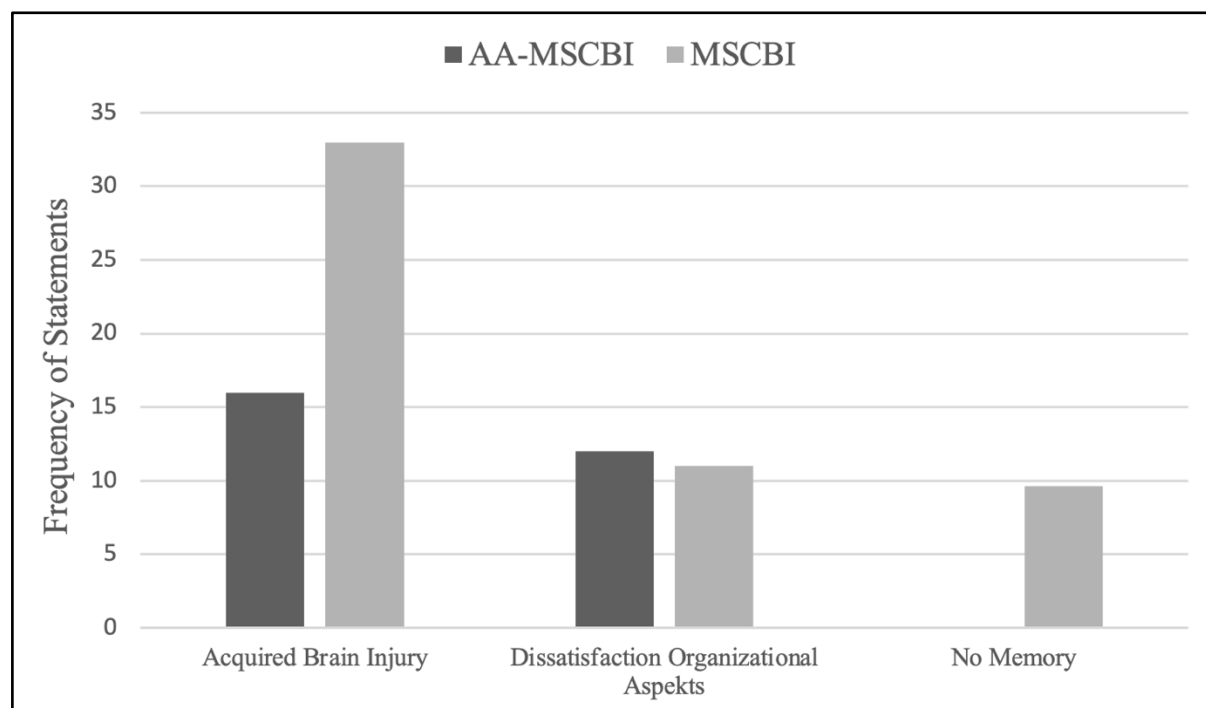
Note. AA-MSCBI = animal-assisted psychotherapeutic mindfulness- and self-compassion-based group intervention; *MSCBI* = standard psychotherapeutic mindfulness- and self-compassion-based group intervention. For this figure, the frequency of the standard MSCBI group (*n* = 8) was extrapolated to the sample size of the AA-MSCBI group (*n* = 11).

Animals

As shown in Figure 5, patients in the animal-assisted MSCBI reported various memories and experiences with the animals. Positive emotions related to the animals were recalled most frequently by 91% of the patients (see Table 3). The patients remembered positive, impressive, and beautiful moments with the animals in which they had fun, were happy, felt pleasure, were delighted, and comforted. Some patients also talked about an individual interaction with a specific animal, experiencing an animal as a model, or finding peace and relaxation through the animals.

Figure 5
Experiences With Animals
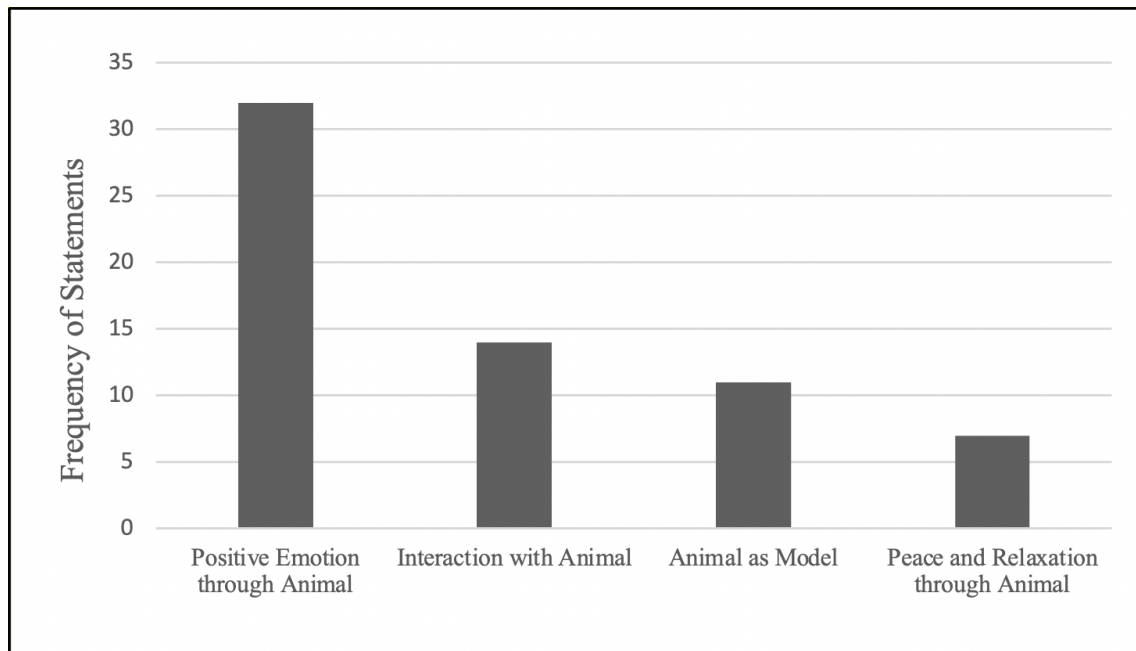
Discussion

This qualitative analysis of the follow-up interviews revealed differences in the statements between the patients in the animal-assisted MSCBI and those in the standard MSCBI. Patients in the animal-assisted MSCBI reported more often that they continued practicing and perceived changes in mindfulness, self-compassion, and daily life. Across all interview questions, on average, patients in the animal-assisted MSCBI made more statements and gave more detailed responses than those in the standard MSCBI. Thus, patients who took part in the animal-assisted MSCBI recalled twice as many exercises as those in the standard MSCBI. No patient in the animal-assisted MSCBI responded that they could not remember, while half of the patients in the standard MSCBI at least once were unable to answer an interview question due to lack of memory. A current pilot study suggests that animal-assisted therapy in neurorehabilitation can improve long-term episodic memory in patients with acquired brain injury by increasing positive emotions and confidence through the presence of an animal (Theis et al., 2020). Therefore, the authors tested the degree to which patients could remember therapy sessions with and without animals. As a further part of their mixed-methods approach, Theis and colleagues (2020) conducted a qualitative content analysis with inductive category formation whose findings were similar to those of the present study. As in our study, the most frequently mentioned category study was "positive emotions related to an animal". These findings are consistent with previous research, which has shown that the presence of an animal can lead to higher levels of

happiness in patients with mental illness (Sahebalzamani et al., 2020), more fun in children with severe neurological impairments (Hediger et al., 2020), and increased mood in patients with acquired brain injury (Hediger, Thommen, et al., 2019). It is also known that school dogs help children focus attention, concentrate (Hediger & Turner, 2014), and reduce stress (Meints et al., 2022), aspects that are essential for learning new content. The induction of positive emotions by animal-assisted therapy could help bring patients into a state where learning and, thus, change are possible. Positive emotions related to animals could have been an important factor helping patients to encode, consolidate, and retrieve the exercises. A good recall may have led patients to continue practicing and, as a result, experience more significant changes in mindfulness, self-compassion, and in daily life.

Compared to patients in the standard MSCBI, patients in the animal-assisted MSCBI mentioned relational aspects more frequently. They reported feeling connected with and accepted by the therapy group and having involved their family, for instance, by telling them about their experiences with the animals. Patients in the animal-assisted MSCBI also remembered personal aspects of their relationship with the therapist more often. Furthermore, some patients in the group with animal assistance reported having found peace and relaxation through the animals. Previous research has shown that engaging animals in therapy improved social behavior in patients with dementia (Wesenberg et al., 2019; Yakimicki et al., 2019) and psychiatric disorders (Peluso et al., 2018), autism (Hill et al., 2019), and acquired brain injury (Hediger et al., 2019). Künzi and colleagues (2022) found that animal-assisted psychotherapy helps patients with an acquired brain injury to feel more secure, accepted, and comforted within therapy sessions. As the analysis of the follow-up interviews in the present study suggests, animal-assisted therapy could have activated patients' soothing system according to Gilbert's affect regulation theory (2014). The soothing system is associated with affection, protection, trust, and satisfaction. These feelings are associated with attachment aspects and might have been caused by the release of oxytocin. As a neuropeptide, oxytocin is thought to decrease anxiety and aggression, lead to empathy, and promote social bonding between domesticated animals and humans (Herbeck et al., 2017; Kirsch, 2005). This also corresponds with a recent study suggesting an association between increased bonding hormones and trust behavior (Tolomeo et al., 2020). Contact with the animals may have triggered the release of bonding hormones in the patients and made them more open and receptive to interpersonal relationships with involved individuals. These neurobiological processes could also be responsible for the reported peace and relaxation through animals by some patients. In this way, animal assistance may have indirectly fostered the establishment

of a safe and trusting environment, in which negative and threatening emotions are possible and allowed. This is crucial for the emotional processing of difficult or traumatic experiences and emotional consequences such as with an acquired brain injury. Improved emotional processing of the acquired brain injury and associated fate during rehabilitation stay could also explain why the patients in the animal-assisted MSCBI were more likely to report positive changes and less likely to report aspects of their brain injury and associated limitations.

       As mentioned, compared with the patients in the standard MSCBI, patients in the animal-assisted MSCBI referred to their brain injury and related limitation less often. Patients who participated in the present study suffered from depressive and anxiety symptoms and had difficulties adjusting to the brain injury. Primarly, depressive symptoms often go hand in hand with maladaptive self-focus and self-rumination (Watkins & Teasdale, 2004). According to Neff (2003), over-identification, self-judgment, and isolation are incompatible with the originally Buddhist concept of self-compassion. Therefore, it is not surprising that training in mindfulness and self-compassion can reduce symptoms of depression, anxiety, and PTSD (Luo et al., 2021; Wilson et al., 2019). Positive emotions related to animals and the sense of connectedness and acceptance by the therapy group may have counteracted self-focus and over-identification, as both are not possible simultaneously. Connectedness with others, such as fellow patients, can also help to realize personal suffering as part of human life that is not unique to them alone. A perception Neff (2003) refers to as "common humanity" and which contrasts with isolation. In the present study, the animal assistance in psychotherapy might have been helpful for the patients to rediscover their connection to themselves by having positive emotions through animals and feeling connected to involved people.

       The most frequently reported category related to the animals was "positive emotion". Thereby patients reported positive, impressive, and beautiful moments with the animals in which they had fun, were happy, felt pleasure, were delighted, and comforted. The design of this study made it difficult to establish a close relationship with a specific animal because patients interacted with many different animals. Although around half of the patients in the animal-assisted MSCBI made a statement about an interaction with a specific animal, it cannot be assumed that aspects of attachment alone were responsible for the positive emotions. The attachment theory and bonding hormones (Ainsworth, 1978; Rockett & Carr, 2014), however, cannot fully explain why some people experience positive emotions without having a relationship to an animal, such as just looking at and observing an animal they have

never seen before. In research, most theories that are discussed in this regard focus on evolution. For example, it has been suggested that positive emotions related to animals we do not have a close relationship with could be caused by the common history of humans and domesticated animals that dates back 10'000 years (Herbeck et al., 2017). Another theory is the biophilia hypothesis which is described as an innate affiliation with nature in general caused by aspects of human evolution (Gullone, 2000). The biophilia hypothesis could be in line with the statements about having enjoyed the nature of a few patients in the animal-assisted MSCBI. It is possible that positive emotions toward animals with whom we do not have a close relationship could represent a form of evolutionary and genetic preparedness. As the statements of some patients suggest, in certain respects, animals may perhaps suit as models, perhaps for mindfulness and self-compassion. This may be for several reasons: animals live in the present, do not think about the past, and do not worry about the future. They do not judge, do not feel insufficient, are authentic, take care of their own needs, can cope with stress, and have healthy interactions with other beings. The research in this field is still very limited and thus far, there have not been any studies found that have explicitly investigated this topic.

Limitations, Strengths, and Future Directions

This qualitative study has clear limitations. Due to the qualitative approach and the small and heterogeneous sample, the findings cannot be generalized and should be taken with caution. The personal and non-anonymous interviewing method may have fostered aspects of social desirability and influenced the responses. Some interviewers were tempted to help the patients to answer the questions. Although we did not count statements following an additional input of an interviewer, it cannot be excluded that these inputs have influenced the answers to the following questions. Furthermore, one interview question had to be deleted because it was apparent that the answers were partly due to social desirability. In future studies with neurological patients suffering from severe impairments, the interviewer should be aware not to help the patients. Also, social desirability should be considered when developing the interview questions and during the interview itself. Overall, the procedure of face-to-face interviews was preferable for this sample because some patients would have been overwhelmed by answering the questions independently and in writing. Since the present investigation was part of a larger trial (Künzi et al., 2022), some limitations refer to both studies. The MSCBI cannot be directly compared with standard mindfulness- and self-compassion-based programs because the treatment protocol was adjusted to the needs of patients with acquired brain injury (Künzi et al., 2022). For a group of patients who are at

very high risk for developing mental disorders (Eliasen et al., 2021; Fakhoury et al., 2021; Iljazi et al., 2020; Medeiros et al., 2020), a nevertheless appropriate approach, and at the same time a strength of the study (Künzi et al., 2022). In the original study with 31 participants, a significant difference in the sample characteristic "affection to animals" was found. The authors hypothesized that this might have impacted the results of their study. The difference was not significant in the 19 patients who participated in the follow-up interview of the present study. Due to the inclusion criteria "willing to work with animals", it can be assumed that all patients who participated in this study liked animals. In future studies on AAT, it might be helpful to reconsider this inclusion criterion so that randomization can additionally be stratified by "affection for animals". In addition to asking about affection for animals, the patients were asked whether they had pets. For future studies, assessing premorbid experiences with animals would be reasonable because a farmer or a patient who rode horses may have a more substantial relationship to the animals used for the study than a pet owner.

The positive impact of animal assistance on memory and learning allows promising prospects and should also be investigated further and more precisely. Moreover, animal-assisted therapy and its impact on interpersonal relationships need research. Especially in patients with post-traumatic life experiences and an absence of trust in humans, animal assistance could be of great therapeutic value. It may also be interesting to find out if animal-assisted therapy decreases rumination and self-focus in patients with depressive symptoms, maybe by positive emotions related to the animals or improved social connectedness. Furthermore, the therapeutic suitability of animals as a model for mindfulness and self-compassion could represent a new field of research. It must be assumed that animal-assisted therapy does not bring benefits to every person and in every life circumstance. Further research should investigate for which people and under which circumstances animal assistance is appropriate. For patients with severe illnesses, such as acquired brain injury and comorbid psychological symptoms, animal-assisted therapy particularly incorporating mindfulness- and self-compassion-based training can be of considerable therapeutic help.

Conclusion

The findings of the present qualitative study revealed differences between the animal-assisted MSCBI and the standard MSCBI. It can be confirmed that animal assistance evokes positive emotions and probably has beneficial effects on learning and memory. The improved learning and memory may explain why patients in the animal-assisted MSCBI were more likely to report having continued practicing the mindfulness- and self-compassion-based

exercises and therefore were more likely to report changes in mindfulness, self-compassion, and daily living. This may also explain why the patients in the animal-assisted MSCBI answered the interview questions at greater length and in far greater detail. Our study confirms that integrating animals into therapy can positively influence social involvement and social connections. This may be caused by neurobiological processes and could be responsible for feelings of safety, comfort, acceptance, ease, and indirectly gratefulness and motivation, as found in the study of Künzi and colleagues (2022). Compared to the animal-assisted MSCBI, patients in the standard MSCBI were more likely to talk about their acquired brain injury and associated limitations. It is conceivable that the inclusion of animals reduced self-focus and fostered positive emotions, connectedness, and common humanity. In this way, animals can help patients with acquired brain injury and comorbid psychological disturbances to rediscover the connection to themselves and other human beings, and thus substantially improve their quality of life. The present study's findings integrate well with existing research on animal-assisted therapy in neurorehabilitation and provide suggestions for further research.

References

Acabchuk, R. L., Brisson, J. M., Park, C. L., Babbott-Bryan, N., Parmelee, O. A., & Johnson, B. T. (2021). Therapeutic Effects of Meditation, Yoga, and Mindfulness-Based Interventions for Chronic Symptoms of Mild Traumatic Brain Injury: A Systematic Review and Meta-Analysis. *Applied Psychology: Health and Well-Being*, *13*(1), 34–62. https://doi.org/10.1111/aphw.12244

Ainsworth, M. D. S. (1978). The Bowlby-Ainsworth attachment theory. *Behavioral and Brain Sciences*, *1*(3), 436–438. https://doi.org/10.1017/S0140525X00075828

Allen, B., Shenk, C. E., Dreschel, N. E., Wang, M., Bucher, A. M., Desir, M. P., Chen, M. J., & Grabowski, S. R. (2022). Integrating Animal-Assisted Therapy Into TF-CBT for Abused Youth With PTSD: A Randomized Controlled Feasibility Trial. *Child Maltreatment*, *27*(3), 466–477. https://doi.org/10.1177/1077559520988790

Ambrosi, C., Zaiontz, C., Peragine, G., Sarchi, S., & Bona, F. (2019). Randomized controlled study on the effectiveness of animal-assisted therapy on depression, anxiety, and illness perception in institutionalized elderly. *Psychogeriatrics*, *19*(1), 55–64. https://doi.org/10.1111/psyg.12367

Bartoli, F., di Brita, C., Crocamo, C., Clerici, M., & Carrà, G. (2018). Early Post-stroke Depression and Mortality: Meta-Analysis and Meta-Regression. *Frontiers in Psychiatry*, *9*. https://doi.org/10.3389/fpsyt.2018.00530

Blöchl, M., Meissner, S., & Nestler, S. (2019). Does depression after stroke negatively influence physical disability? A systematic review and meta-analysis of longitudinal studies. *Journal of Affective Disorders*, *247*, 45–56. https://doi.org/10.1016/j.jad.2018.12.082

Brazinova, A., Rehorcikova, V., Taylor, M. S., Buckova, V., Majdan, M., Psota, M., Peeters, W., Feigin, V., Theadom, A., Holkovic, L., & Synnot, A. (2021). Epidemiology of Traumatic Brain Injury in Europe: A Living Systematic Review. *Journal of Neurotrauma*, *38*(10), 1411–1440. https://doi.org/10.1089/neu.2015.4126

Carlson, L. E., & Garland, S. N. (2005). Impact of mindfulness-based stress reduction (MBSR) on sleep, mood, stress, and fatigue symptoms in cancer outpatients. *International Journal of Behavioral Medicine*, *12*(4), 278–285. https://doi.org/10.1207/s15327558ijbm1204_9

Eaton-Stull, Y., Wright, C., DeAngelis, C., & Zambroski, A. (2021). Comparison of DBT Skills Groups with and without Animal-Assistance for Incarcerated Women with Self Harm Histories. *Corrections*, *6*(3), 217–228. https://doi.org/10.1080/23774657.2019.1629849

Eliasen, M. H., Petersen, J., Benros, M. E., & Osler, M. (2021). Number of traumatic brain injuries and temporal associations with depression: A register-based cohort study. *Acta Psychiatrica Scandinavica*, *144*(4), 407–414. https://doi.org/10.1111/acps.13347

Fakhoury, M., Shakkour, Z., Kobeissy, F., & Lawand, N. (2021). Depression following traumatic brain injury: a comprehensive overview. *Reviews in the Neurosciences*, *32*(3), 289–303. https://doi.org/10.1515/revneuro-2020-0037

Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., Fisher, M., Pandian, J., & Lindsay, P. (2022). World Stroke Organization (WSO): Global Stroke Fact Sheet 2022. *International Journal of Stroke*, *17*(1), 18–29. https://doi.org/10.1177/17474930211065917

Fonseka, B., Marshall, F., & Edwards, L. J. (n.d.). The Effects of Animal-Assisted Therapy on the Health and Well-Being of Military Veterans: A Systematic Scoping Review and Recommendations for Future Research. In *People and Animals: The International Journal of Research and Practice* (Vol. 5).

Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, *53*(1), 6–41. https://doi.org/10.1111/bjc.12043

Gocheva, V., Hund-Georgiadis, M., & Hediger, K. (2018). Effects of animal-assisted therapy on concentration and attention span in patients with acquired brain injury: A randomized controlled trial. *Neuropsychology*, *32*(1), 54–64. https://doi.org/10.1037/neu0000398

Gullone, E. (2000). The Biophilia Hypothesis and Life in the 21st Century: Increasing Mental Health or Increasing Pathology? *Journal of Happiness Studies*, *1*(3), 293–322. https://doi.org/10.1023/A:1010043827986

Guo, J., Wang, J., Sun, W., & Liu, X. (2022). The advances of post-stroke depression: 2021 update. *Journal of Neurology*, *269*(3), 1236–1249. https://doi.org/10.1007/s00415021-10597-4

Hediger, K., Boek, F., Sachers, J., Blankenburg, U., Antonius-Kluger, E., Rist, B., Schaudek, M., Staudt, M., & Kluger, G. (2020). Dog-Assisted Therapy in Neurorehabilitation of Children with Severe Neurological Impairment: An Explorative Study. *Neuropediatrics*, *51*(04), 267–274. https://doi.org/10.1055/s-0040-1708545

Hediger, K., Petignat, M., Marti, R., & Hund-Georgiadis, M. (2019). Animal-assisted therapy for patients in a minimally conscious state: A randomized two treatment multi-period crossover trial. *PLOS ONE*, *14*(10), e0222846. https://doi.org/10.1371/journal.pone.0222846

Hediger, K., Thommen, S., Wagner, C., Gaab, J., & Hund-Georgiadis, M. (2019). Effects of animal-assisted therapy on social behaviour in patients with acquired brain injury: a randomised controlled trial. *Scientific Reports*, *9*(1), 5831. https://doi.org/10.1038/s41598-019-42280-0

Hediger, K., & Turner, D. C. (2014). Can dogs increase children's attention and concentration performance? A randomised controlled trial. In *Animal Interaction Bulletin* (Vol. 2, Issue 2).

Hediger, K., Wagner, J., Künzi, P., Haefeli, A., Theis, F., Grob, C., Pauli, E., & Gerger, H. (2021). Effectiveness of animal-assisted interventions for children and adults with post-traumatic stress disorder symptoms: a systematic review and meta-analysis. *European Journal of Psychotraumatology*, *12*(1). https://doi.org/10.1080/20008198.2021.1879713

Herbeck, Yu. E., Gulevich, R. G., Shepeleva, D. v., & Grinevich, V. v. (2017). Oxytocin: Coevolution of human and domesticated animals. *Russian Journal of Genetics: Applied Research*, *7*(3), 235–242. https://doi.org/10.1134/S2079059717030042

Hill, J., Ziviani, J., Driscoll, C., & Cawdell-Smith, J. (2019). Can Canine-Assisted Interventions Affect the Social Behaviours of Children on the Autism Spectrum? A Systematic Review. *Review Journal of Autism and Developmental Disorders*, *6*(1), 13–25. https://doi.org/10.1007/s40489-018-0151-7

Hilton, L., Hempel, S., Ewing, B. A., Apaydin, E., Xenakis, L., Newberry, S., Colaiaco, B., Maher, A. R., Shanman, R. M., Sorbero, M. E., & Maglione, M. A. (2017). Mindfulness Meditation for Chronic Pain: Systematic Review and Meta-analysis. *Annals of Behavioral Medicine*, *51*(2), 199–213. https://doi.org/10.1007/s12160-0169844-2

Hughes, M., Brown, S. L., Campbell, S., Dandy, S., & Cherry, M. G. (2021). Self Compassion and Anxiety and Depression in Chronic Physical Illness Populations: a Systematic Review. *Mindfulness*, *12*(7), 1597–1610. https://doi.org/10.1007/s12671021-01602-y

Iljazi, A., Ashina, H., Al-Khazali, H. M., Lipton, R. B., Ashina, M., Schytz, H. W., & Ashina, S. (2020). Post-Traumatic Stress Disorder After Traumatic Brain Injury - A Systematic Review and Meta-Analysis. *Neurological Sciences*, *41*(10), 2737–2746. https://doi.org/10.1007/s10072-020-04458-7

Kabat-Zinn, J. (2013). *Full Catastrophe Living: How to cope with stress, pain, and illness using mindfulness meditation*. Hachette.

Kirsch, P. (2005). Oxytocin Modulates Neural Circuitry for Social Cognition and Fear in Humans. *Journal of Neuroscience*, *25*(49), 11489–11493. https://doi.org/10.1523/JNEUROSCI.3984-05.2005

Künzi, P., Ackert, M., grosse Holtforth, M., Hund-Georgiadis, M., & Hediger, K. (2022). Effects of animal-assisted psychotherapy incorporating mindfulness and self-compassion in neurorehabilitation: a randomized controlled feasibility trial. *Scientific Reports*, *12*(1), 10898. https://doi.org/10.1038/s41598-022-14584-1

Luo, X., Che, X., Lei, Y., & Li, H. (2021). Investigating the Influence of Self-Compassion Focused Interventions on Posttraumatic Stress: A Systematic Review and Meta-Analysis. *Mindfulness*, *12*(12), 2865–2876. https://doi.org/10.1007/s12671-02101732-3

Marshall, E. M., & Frazier, P. A. (2019). Understanding posttrauma reactions within an

attachment theory framework. *Current Opinion in Psychology*, *25*, 167–171. https://doi.org/10.1016/j.copsyc.2018.08.001

Mayring, P. (2021). *Qualitative Content Analysis: A Step-by-Step Guide*. SAGE.

Medeiros, G. C., Roy, D., Kontos, N., & Beach, S. R. (2020). Post-stroke depression: A 2020 updated review. *General Hospital Psychiatry*, *66*, 70–80. https://doi.org/10.1016/j.genhosppsych.2020.06.011

Meints, K., Brelsford, V. L., Dimolareva, M., Maréchal, L., Pennington, K., Rowan, E., & Gee, N. R. (2022). Can dogs reduce stress levels in school children? effects of dog-assisted interventions on salivary cortisol in children with and without special educational needs using randomized controlled trials. *PLOS ONE*, *17*(6), e0269333. https://doi.org/10.1371/journal.pone.0269333

Mishra, R., Florez-Perdomo, W. A., Shrivatava, A., Chouksey, P., Raj, S., Moscote-Salazar, L. R., Rahman, M. M., Sutar, R., & Agrawal, A. (2021). Role of Music Therapy in Traumatic Brain Injury: A Systematic Review and Meta-analysis. *World Neurosurgery*, *146*, 197–204. https://doi.org/10.1016/j.wneu.2020.10.130

Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J. L., & Chertkow, H. (2005). The Montreal Cognitive Assessment MoCA: A Brief Screening Tool For Mild Cognitive Impairment. *Journal of the American Geriatrics Society*, *53*(4), 695–699. https://doi.org/10.1111/j.15325415.2005.53221.x

Neff, K. (2003). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity*, *2*(2), 85–101. https://doi.org/10.1080/15298860309032

O'Haire, M. E., McKenzie, S. J., McCune, S., & Slaughter, V. (2013). Effects of Animal Assisted Activities with Guinea Pigs in the Primary School Classroom. *Anthrozoös*, *26*(3), 445–458. https://doi.org/10.2752/175303713X13697429463835

Onwuegbuzie, A. J., & Leech, N. L. (2007). A Call for Qualitative Power Analyses. *Quality & Quantity*, *41*(1), 105–121. https://doi.org/10.1007/s11135-005-1098-1

Peluso, S., de Rosa, A., de Lucia, N., Antenora, A., Illario, M., Esposito, M., & de Michele, G. (2018). Animal-Assisted Therapy in Elderly Patients: Evidence and Controversies in Dementia and Psychiatric Disorders and Future Perspectives in Other Neurological Diseases. *Journal of Geriatric Psychiatry and Neurology*, *31*(3), 149–157. https://doi.org/10.1177/0891988718774634

Reilly, K. M., Adesope, O. O., & Erdman, P. (2020). The Effects of Dogs on Learning: A
Meta-Analysis. *Anthrozoös*, *33*(3), 339–360.
https://doi.org/10.1080/08927936.2020.1746523

Rockett, B., & Carr, S. (2014). Animals and Attachment Theory. *Society & Animals*, *22*(4),
415–433. https://doi.org/10.1163/15685306-12341322

Sahebalzamani, M., Rezaei, O., & Moghadam, L. F. (2020). Animal-assisted therapy on
happiness and life quality of chronic psychiatric patients living in psychiatric
residential care homes: a randomized controlled study. *BMC Psychiatry*, *20*(1), 575.
https://doi.org/10.1186/s12888-020-02980-8

Schramm, E., Breuninger, C., Wohlfarth, R., Elsaesser, M., Piosczyk, H., & Fangmeier, T.
(2022). Effectiveness of Nature- and Animal Assisted Mindfulness for Relapse
Prevention in Depressed Patients With a History of Childhood Maltreatment.
Frontiers in Psychiatry, *13*. https://doi.org/10.3389/fpsyt.2022.899318

Schramm, E., Hediger, K., & Lang, U. E. (2015). From Animal Behavior to Human Health.
Zeitschrift Für Psychologie, *223*(3), 192–200.
https://doi.org/10.1027/2151-2604/a000220

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2018). *Mindfulness-Based Cognitive
Therapy for Depression*. Guilford.

Strauss, C., Cavanagh, K., Oliver, A., & Pettman, D. (2014). Mindfulness-Based
Interventions for People Diagnosed with a Current Episode of an Anxiety or
Depressive Disorder: A Meta-Analysis of Randomised Controlled Trials. *PLoS ONE*,
9(4), e96110. https://doi.org/10.1371/journal.pone.0096110

Sydnor, V. J., Bouix, S., Pasternak, O., Hartl, E., Levin-Gleba, L., Reid, B., Tripodis, Y.,
Guenette, J. P., Kaufmann, D., Makris, N., Fortier, C., Salat, D. H., Rathi, Y.,
Milberg, W. P., McGlinchey, R. E., Shenton, M. E., & Koerte, I. K. (2020). Mild
traumatic brain injury impacts associations between limbic system microstructure and
post-traumatic stress disorder symptomatology. *NeuroImage: Clinical*, *26*, 102190.
https://doi.org/10.1016/j.nicl.2020.102190

Taylor, J., McLean, L., Korner, A., Stratton, E., & Glozier, N. (2020). Mindfulness and yoga
for psychological trauma: systematic review and meta-analysis. *Journal of Trauma &
Dissociation*, *21*(5), 536–573. https://doi.org/10.1080/15299732.2020.1760167

Theis, F., Luck, F., Hund-Georgiadis, M., & Hediger, K. (2020). Influences of Animal
Assisted Therapy on Episodic Memory in Patients with Acquired Brain Injuries.

International Journal of Environmental Research and Public Health, *17*(22), 8466.
https://doi.org/10.3390/ijerph17228466

Tolomeo, S., Chiao, B., Lei, Z., Chew, S. H., & Ebstein, R. P. (2020). A Novel Role of CD38
and Oxytocin as Tandem Molecular Moderators of Human Social Behavior.
Neuroscience & Biobehavioral Reviews, *115*, 251–272.
https://doi.org/10.1016/j.neubiorev.2020.04.013

van den Brink, E., & Koster, F. (2015). *Mindfulness-Based Compassionate Living*.
Routledge. https://doi.org/10.4324/9781315764184

Watkins, E., & Teasdale, J. D. (2004). Adaptive and maladaptive self-focus in depression.
Journal of Affective Disorders, *82*(1), 1–8. https://doi.org/10.1016/j.jad.2003.10.006

Wesenberg, S., Mueller, C., Nestmann, F., & Holthoff-Detto, V. (2019). Effects of an
animal-assisted intervention on social behaviour, emotions, and behavioural and
psychological symptoms in nursing home residents with dementia. *Psychogeriatrics*,
19(3), 219–227. https://doi.org/10.1111/psyg.12385

Wilson, A. C., Mackintosh, K., Power, K., & Chan, S. W. Y. (2019). Effectiveness of Self
Compassion Related Therapies: a Systematic Review and Meta-analysis. *Mindfulness*,
10(6), 979–995. https://doi.org/10.1007/s12671-018-1037-6

Winders, S., Murphy, O., Looney, K., & O'Reilly , G. (2020). Self-compassion, trauma, and
posttraumatic stress disorder: A systematic review. *Clinical Psychology &
Psychotherapy*, *27*(3), 300–329. https://doi.org/10.1002/cpp.2429

Wintermantel, L., & Grove, C. (2022). An evaluation of a dog-assisted social and emotional
learning intervention in a school setting: Study protocol for a cluster-randomised trial.
Mental Health & Prevention, *28*, 200246. https://doi.org/10.1016/j.mhp.2022.200246

Woodhouse, S., Ayers, S., & Field, A. P. (2015). The relationship between adult attachment
style and post-traumatic stress symptoms: A meta-analysis. *Journal of Anxiety
Disorders*, *35*, 103–117. https://doi.org/10.1016/j.janxdis.2015.07.002

Yakimicki, M. L., Edwards, N. E., Richards, E., & Beck, A. M. (2019). Animal-Assisted
Intervention and Dementia: A Systematic Review. *Clinical Nursing Research*, *28*(1),
9–29. https://doi.org/10.1177/1054773818756987

Yeates, G. N., & Ashworth, F. (Eds.). (2019). *Psychological Therapies in Acquired Brain
Injury*. Routledge. https://doi.org/10.4324/9780429506796

Yeates, G., Smith, A., Nagrani, S., Khan, E., & Dorney-Savage, J. (2022). A mixed methods
pilot study of a 6 month weekly Taj Ji (Tai Chi) group for survivors of acquired brain
injury. *Praxis Psy, 23*(37), 1-94. https://doi.org/10.32995/praxispsy.v23i37.176

Appendix A

Interview Questions

Part I: Narrative introduction

---

1. What do you remember about the study?
2. Are there specific experiences you had within the study or small things you still think back to today?

Part II: Memories of the study

---

3. Which exercises can you still remember?
4. Are there any positive situations about the study that you remember fondly?
5. Are there any negative situations about the study that you do not like to think back to?

Part III: Balance sheet

---

6. How important were the sessions for you in your weekly therapy program?
7. Did you continue to practice specific exercises after the program ended?
8. Did those around you notice any changes in you since the study? If yes, which ones?
9. What influence do the experiences of the study have on you today?

Appendix B

Cohen's Kappa for the 25 Subcategories

Category	Cohen's Kappa	SD	CI
Mindfulness exercise	0.976	0.014	0.948 to 1.003
Self-compassion exercise	1.000	0.000	1.000 to 1.000
Exercises in general	1.000	0.000	1.000 to 1.000
Exercise with animals	0.991	0.009	0.975 to 1.008
Connectedness therapy group	0.938	0.036	0.866 to 1.008
Interaction with therapist	0.931	0.048	0.836 to 1.026
Involving family	0.938	0.036	0.866 to 1.008
Fellow patient	0.931	0.048	0.837 to 1.026
Change within session	1.000	0.000	1.000 to 1.000
Change over intervention	0.888	0.111	0.670 to 1.106
Change mindfulness	0.952	0.033	0.887 to 1.018
Change self-compassion	0.867	0.076	0.717 to 1.016
Change daily life	0.832	0.058	0.718 to 0.946

Category	Cohen's Kappa	SD	CI
Continued practicing	0.970	0.021	0.929 to 1.011
No change	0.908	0.091	0.729 to 1.087
Not continued practicing	0.856	0.142	0.577 to 1.135
Acquired brain injury	0.987	0.013	0.960 to 1.013
Dissatisfaction organizational aspects	0.948	0.037	0.876 to 1.020
No memory	1.000	0.000	1.000 to 1.000
Positive emotions through animals	0.933	0.033	0.868 to 0.998
Interaction with animal	0.962	0.038	0.888 to 1.036
Animal as model	1.000	0.000	1.000 to 1.000
Peace and relaxation through animal	1.000	0.000	1.000 to 1.000
Animals at the Rehab	0.946	0.053	0.843 to 1.051
Nature	1.000	0.000	1.000 to 1.000
Mean	**0.950**		

Selbstständigkeitserklärung

Ich erkläre hiermit, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Stellen, die wörtlich oder sinngemäss aus Quellen entnommen wurden, habe ich als solche gekennzeichnet. Mir ist bekannt, dass andernfalls der Senat gemäss Artikel 36 Absatz 1 Buchstabe o des Gesetzes vom 5. September 1996 über die Universität zum Entzug des auf Grund dieser Arbeit verliehenen Titels berechtigt ist.

Für die Zwecke der Begutachtung und der Überprüfung der Einhaltung der Selbständigkeitserklärung bzw. der Reglemente betreffend Plagiate erteile ich der Universität Bern das Recht, die dazu erforderlichen Personendaten zu bearbeiten und Nutzungshandlungen vorzunehmen, insbesondere die schriftliche Arbeit zu vervielfältigen und dauerhaft in einer Datenbank zu speichern sowie diese zur Überprüfung von Arbeiten Dritter zu verwenden oder hierzu zur Verfügung zu stellen.

Bern, 22.10.2022   Sarah Kuhn