European Journal of Integrative Medicine 14 (2017) 13–19

Contents lists available at ScienceDirect

European Journal of Integrative Medicine

journal homepage: www.elsevier.com/locate/eujim

Research paper

Animal-assisted therapy used for anxiety disorders in patients with learning disabilities: An observational study

F. Giuliani[a,*], M. Jacquemettaz[a,b]

[a] Section of Psychiatry of Mental Development, Department of Psychiatry at the Vaud University Hospital, Lausanne, Switzerland
[b] Institute of Psychology, University of Lausanne, Switzerland

ARTICLE INFO

Keywords:
Intellectual disability
Dog
Animal-assisted therapy
Anxiety disorders
Learning disability

ABSTRACT

Introduction: Animal-assisted therapy is defined as the positive interaction between an animal and a patient within a therapeutic framework. Previous studies have reported on the beneficial effects of animal-assisted therapy with patients suffering from anxiety, a major challenge for professionals caring for patients with intellectual disability. The presence of psychiatric comorbidities such as depression or anxiety within this population is two to four times higher than in the general population. Finding new treatment options for such anxiety disorders is important. The aim of this observational study was to explore whether the level of anxiety decreased when a dog was present during therapy for people with learning disability.

Method: This was an observational study which involved 53 adult patients with mild learning disabilities (26 men) average age, 36.5 ± 11.2 years.

The State-Trait Anxiety Inventory (STAI) was completed by participants with the therapist, before and after two 30-min therapeutic sessions, one in the presence of a dog and the other with only the therapist.

Results: The STAI score significantly decreased after the session with the dog, which was not the case after the session without the dog). After the animal-assisted session, the STAI score was significantly lower ($Z = -4.654$; $p < 0.0001$), which was not the case for the session without the dog ($Z = -1.054$; $p = 0.295$). There was a significant difference in anxiety between men and women.

Conclusion: Results suggest that there are positive benefits of animal-assisted therapy for individuals with learning disabilities which require confirmation in a randomized controlled trial.

1. Introduction

Anxiety disorders represent a major challenge for the therapy teams and the families who care for individuals with learning disabilities. This group is very difficult to treat, and existing methods to help them are very limited.

This kind of disorder principally manifests itself through a more or less acute concern regarding certain activities perceived as stressful or challenging. But it can also manifest during therapy sessions meant to confront the challenges of daily life or social relationships, which will reduce the therapy's effectiveness. Generalized anxiety can lead to behavioral problems like agitation, irritability, tiredness, muscle tension, lowered concentration level and difficulties in sharing attention with a speaker. For individuals suffering from anxiety disorders, therapeutic measures generally involve the combination of an anti-anxiety medication and therapeutic support. As highlighted by Hoffman, Hyung Lee et al. [1], discussions surrounding the clinical effects of these medicines raised the necessity of finding alternative and additional treatments to medicine-based treatments. Previous studies have shown that domestic animals make it possible to decrease an individual's stress and anxiety level. A pilot study demonstrated that a 15-min interaction with a dog significantly reduced patient anxiety [2]. Going beyond this benefit, other authors have discovered that the presence of a dog leads to lowered blood pressure and a decrease in the level of cortisol in stressed patients [3–6]. Individuals with mental retardation also have difficulty communicating, something which hinders their care. Traditional therapies only partially improve the situation of these individuals, because they often rely on verbal communication [7], something that animal-based therapy can work around [8].

Animal-assisted therapy (AAT) seems to be a particularly attractive method for helping individuals suffering from anxiety disorders. Animal therapy is defined as the deliberate inclusion of a trained animal in a treatment and whose goal is to achieve results that are difficult to obtain in another way and facilitated through the interaction with the animal [9]. The use of a dog is not insignificant. Indeed, dogs have been protecting humans for more than 15,000 years, something which offers

* Corresponding author.
E-mail address: fabienne.giuliani@chuv.ch (F. Giuliani).

http://dx.doi.org/10.1016/j.eujim.2017.08.004
Received 23 March 2017; Received in revised form 10 August 2017; Accepted 11 August 2017

a feeling of security and comfort [1], and which is not necessarily found in traditional therapy techniques. Often perceived as "man's best friend", the animal's spontaneous enthusiasm for social interactions provides a substantial stimulus for the individual's social behavior. The presence of the dog facilitates communication between the therapist and the patient, which increases their positive interactions. Numerous studies have shown the effectiveness and usefulness of animals in therapy, but AAT does more than that. AAT seems too particularly interest patients [2]. More than just helping the person calm down and develop social behaviors, the animal provides a source of motivation.

Nimer and Lundahl's [10] meta-analysis demonstrated that the effect size of AAT was 0.35 for well-being, 0.63 for behavior and 0.93 for medical, for individuals with a mental diagnosis who were treated with AAT compared to those with a mental diagnosis who did not receive AAT. Kamioka et al. [11] and Kruger and Serpell [12], have affirmed that animals are a useful addition to therapy to diminish anxiety. For many patients, having a session with a therapist is a stressful experience and the presence of a dog tends to calm this stress and reduce anxiety. The animal is then used as a way of turning the patient's attention away from the anxiety-producing situation. Finally, Berget et al. [13] indicate in their article that a decrease of anxiety is visible in the six months following AAT, but not immediately for the population studied. For our population, no study has yet been conducted on patients with intellectual disability and anxiety. Individuals living with mild learning disabilities deserve the development of new psychotherapeutic methods that are adapted to their possibilities. They are aware, in a more or less frustrating way, of what challenges them or worries them in a given existential situation. As we have seen, AAT offers an interesting alternative support. Based on the study by Hoffman, Hyung Lee et al. [1] as inspiration, we wanted to test the effects of a playful interaction with a dog within the framework of a basic therapy support situation with individuals living with a mild learning disabilities. The support situation involves therapeutic interviews oriented toward problem-solving. The goal of the research was thus to verify, within the framework of a standard therapeutic intervention, how much can mediating the process of entering a relationship through interactions with a dog produce a measurable soothing of the patient's anxiety. Hoffman, Hyung Lee et al. [1] discovered that AAT reduced anxiety levels in patients suffering from depression even more than classic therapy. We wanted to verify whether the same result could be found working with a population of patients with mental disabilities. Our hypothesis was that the level of anxiety would decrease when a dog was present during therapy.

2. Patients and methods

2.1. Patients

We were interested in a patient group with intellectual disability. A total of 60 people were approached and only 7 refused to take part in the study. Of the 53 adult patients, 26 men and 27 women (36.5 ± 11.2 years), 13 patients, lived in the family home and 40 patients were living in a unit belonging to a specialized institution. All came with a carer or a parent.

All participants were diagnosed by a psychologist and received the diagnosis of having mild learning disabilities, meaning an IQ between 50 and 70 (mild mental retardation according to the CIM-10: F70), and were under regular outpatient treatment at the Section of Psychiatry of Mental Development (SPDM) at the University Hospital Center, Vaud (CHUV). They also presented with symptoms of generalized anxiety (generalized anxiety disorder according to CIM-10: F41.1) as diagnosed by a psychiatrist. No patient was having medication during the study. Thus, our inclusion criteria were that the individual had both an intellectual disability and an anxiety disorder. Exclusion criteria were dog phobia or an allergy or aversion to dogs. The degree of intellectual disability was determined using the Wechsler Intelligent Scale for Adult (WAIS-IV). In order to measure anxiety, we used the STAI, the State-Trait Anxiety Inventory by Spielberg [14].

2.2. Procedures

For this study, we used a single-subject design in which the subject group was its own control group. In the article by Hoffman & et al., the sample studied involved 12 participants. We wanted to increase the sample (n = 53), which would provide a sufficient sample size for the Wilcoxon test. (Indeed, according to the Wilcoxon tables, a large sample is superior or equal to 25.)

The protocol for the clinical study was written based on the same methodology as Hoffmann but adapted to our population [1]. The protocol (n° 285/13) entitled "Animal-assisted therapy used for anxiety disorder in patients with learning disabilities" was approved by the Swiss Ethics Committee (CER-VD and Swissmedic nb 285/13, 09/25/2014). Prior to participation in the evaluation, written consent was obtained from the participant's legal representative. Individuals were well known to the author and, in the opinion of the authors, had a receptive language sufficient to understand the instructions. Patients could not give their written consent, but they agreed orally to participate in the study. The etiology of intellectual disability was not examined.

The dog used was a border collie trained for this purpose (Fig. 1). The dog and the therapist were trained by the Swiss Romande Cynology Federation (authorization nb OVF 08/0008). An authorization request to use the dog on site at the Cery Hospital was made to the direction of the CHUV. The STAI was usable within the framework of our research, as our target population was comprised of individuals whose learning disabilities only moderately inhibited verbalization and comprehension capacity. The STAI is a self-evaluation, it is generally filled out by the subject with the therapist's help. In consideration of our patients' mild learning disabilities, the different questions are formulated and explained orally by the researcher who collected responses during a semi-structured interview. Data collection was conducted in a way to ensure the patient's anonymity.

2.3. Intervention

Sessions were organized always for the same hour. The session with the dog and the therapist was organized as follows. When the patient arrived in the waiting room, the patient was led into an interview room to fill out the STAI together. The questions were formulated orally so that the patient could understand the meaning of the questions. If the question was poorly understood, the question was reformulated by the therapist. Once the questionnaire was completed, the patient selected the activity that he wanted to do with the dog: play ball with the dog, pet the dog or brush it. During this activity, the therapist intervened to ask questions related to dogs, related to the patients experience with animals in general and the like in order to see if the activity was

Fig. 1. "Doudou", the dog used for animal-assisted therapy.

working well. The patient was given a choice to remain in the interview room with the animal or go out into the garden arranged for this purpose in front of our offices. At the end of 30 min, the therapist ended the activity and filled out the questionnaire again with patient. During this time, the dog remained lying down in the interview room. For the session with only the therapist, a calm habitual interview was conducted for 30 min. In this situation, the therapist encouraged the patient to speak about his or her physical and psychological health. Like the session with the dog, the STAI was completed before and after the interview with the patient, in the form of a semi-structured interview.

2.4. Statistical analyses

The Wilcoxon signed-rank test was used in order to evaluate the influence of the interaction?with the dog. Results are presented as averages ± a standard deviation. Analyses were conducted on a computer using a statistical program (Statview 5.0). A value of $p < 0.05$ was considered significant. In order to calculate the effect size, we calculated Cohen's d [15].

3. Results

At the time of the study, all patients were undergoing a regular outpatient treatment at the SPDM of the CHUV for mild learning disabilities and symptoms of generalized anxiety. No participant was excluded according to the exclusion criteria. Patient IQ was 61.7 ± 6.1. The average for the STAI score before the control session was 57.5 ± 7.9 and 55.8 ± 7.9 after the control session. For the animal-assisted session, the STAI score was 54.6 ± 7.4 before the session and 47.2 ± 8.9 after the session. After the animal-assisted session, the STAI score was significantly lower ($Z = -4.654$; $p < 0.0001$), while it remained statistically unchanged for the control group ($Z = -1.054$; $p = 0.295$) (Fig. 2). This meant that we achieved an effect size of 0.22 for the control session, which indicated a weak effect of the therapy on the anxiety level. For the animal-assisted session, the effect size increased to 0.83, which meant that the effect of the therapy with the dog was strong. We also found a significant difference between men and women when the dog was present. The women had a STAI score of 49.7 ± 9.3 following the session with the dog, meaning an effect size of 0.73, while the men's STAI score was 44.5 ± 7.7 after this session ($Z = 2.215$; $p = 0.031$) (Fig. 3), for an effect size of 1. No other significant difference between the men and women was found.

A supplementary analysis was performed comparing the STAI measured after the first session between the groups receiving first the AAT or the ordinary therapy. Comparing only the first sessions in the current design (the first session attributed randomly to AAT or ordinary) is the equivalent of a randomized controlled study, and we can perform ordinary tests to assess the effect of AAT compared to the ordinary therapy. Such a comparison can be performed using a linear regression adjusted for gender. A significant improvement in STAI among patients receiving AAT compared to ordinary therapy, confirmed the previous results. This analysis is presented in the Appendix A.

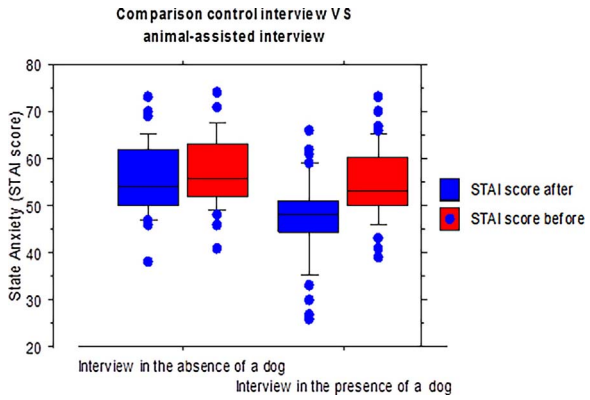

Fig. 2. Comparison of the results of the self-questionnaire on anxiety level (STAI) at the beginning and the end of the session. There appears for all patients (men and women) a significant difference only in the presence of the dog ($p < 0.0001$) while it remains unchanged without the dog. The power for the session in which the dog was present was 0.999 and for the session without the dog was 0.171.

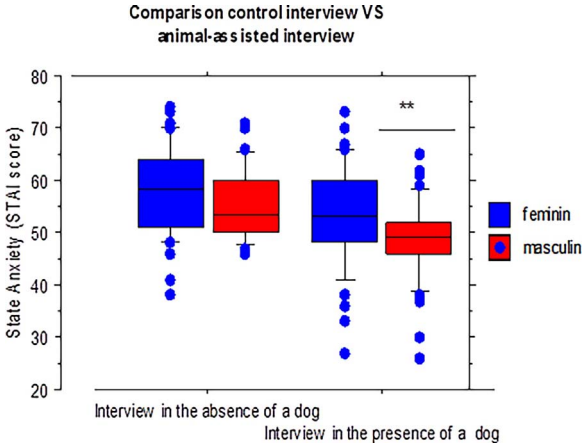

Fig. 3. Comparison of the results of the self-questionnaire on anxiety level (STAI) between the men and the women. There appears a significant difference in the presence of the dog between men and women ($p = 0.0031$). The level of the men's anxiety was more significantly reduced compared to the women.

The authors do not think it is necessary to employ the path analysis in the current study, as the main question is the effect of AAT compared to the ordinary therapy and the direct or indirect effect of therapy itself is well established in the literature.

4. Discussion

Our study takes its inspiration directly from that of Hoffman et al. [1], and it would be prudent to make a deeper comparison between their results and ours. Table A1 summarizes the respective results from each study. In our study, the patients had a higher anxiety score (STAI) before the session, whether they were with the dog or not, than the patients who took part in the study by Hoffman et al. This difference was conserved after the session, and in both cases. It would be interesting to compare the scores from the patients in Hoffman et al.'s study (2009) to the scores from our patients, in order to determine whether this difference is significant. We can explain the increase in anxiety disorders in the population living with learning disabilities by the fact that numerous authors have indicated that co-morbidities are greater in this population compared to the general population [16–18], which could explain why our patients are more anxious than the patients of the original study. According to the Inserm report (2016) [18], the co-morbidities most associated with intellectual disability are "psychotic disorders, mood disorders and anxiety disorders, personality disorders, substance abuse, autism spectrum disorders, hyperactivity and attention deficit syndrome" (p.290). According to epidemiological studies cited in this report, anxiety disorders range between 1.7 and 17.4% in individuals presenting with learning disabilities. This rate is 3 to 4 times higher than in the rest of the population [19,20]. Another important element highlighted was the p-value in the session with the dog. The p-value in Hoffman et al.'s research (2009) already made it possible to affirm that the presence of the dog elicited a significant decrease in patient anxiety. The p-value in our study confirms the dog's therapeutic contribution. It would thus seem that our patients were even more receptive to the presence of the dog than the patients in the original study. These two differences can be explained by the greater number of participants in our study (12 patients in the study by Hoffmann et al.

versus 53 patients in ours) and by the respective diagnoses of the patients in each study (major unipolar depression in the study by Hoffman & al. versus slight learning disabilities in our study). (see for more information, Table A1 in Appendix A)

Something that is particularly interesting to note in our results is the difference between the average of the men's STAI scores and the average of the women's STAI scores following the animal-assisted session. Essentially, our results indicate that the men seem to be more sensitive to the presence of the dog than the women, which manifests itself by the men's lower anxiety level after the session. The difference of the STAI scores between the two groups before the animal-assisted session was not significant, which is a good indication that the men benefitted more from the dog's presence during the session. A new study would be necessary in order to find an explanation to this discovery.

The reason the dog brings about a decrease in anxiety seems to be found in neurobiological mechanisms, and more precisely in the neural endocrine system. Several studies indicate that this decrease is caused by oxytocin, a neuropeptide secreted by the supraoptic and paraventricular nuclei of the hypothalamus [6,19,21–24]. Indeed, oxytocin is known to have, among other things, an anti-stress effect. When the oxytocin level is high, the level of cortisol, the hormone responsible for stress, is low. These two hormones provide a balance. Studies have shown that when an individual interacts positively with a dog, even for a limited amount of time, his or her oxytocin level increases, at least temporarily, leading logically to a decrease in cortisol levels. This increase is higher during a positive interaction with an animal than it is with other relaxing activities, such as quietly reading a book. Another factor must be taken into consideration. According to Walf and Frye [25] and Li and Graham [26], women are more subject to mood disorders and anxiety disorders than are men. Indeed, menstruation—a period during which the level of estrogen in the body lowers—makes women more susceptible to depression and to anxiety. After menopause, this phenomenon leads to a twice higher risk of women developing one of these disorders. The hippocampus and the amygdala are sensitive to estrogen. A fluctuation of these hormones involves a modification of their activity. To sum up, a high level of estrogen leads to a high activity level in these two regions, thus reducing anxiety and depression. It would be interesting to see then, if the level of estrogen changes during exposure to AAT.

A limitation of this study is that we did not have a control group. A before and after study was conducted using subjects as their own controls.

To conclude, our results are in line with those reported by Hoffmann et al., who inspired us, and showed once again the beneficial effects of using animals as a therapeutic intervention. These results also demonstrated a significant difference in anxiety levels between men and women after a session with the dog. Thanks to the physiological benefits and from a dog's connection and historical evolution alongside humans, dogs are particularly suited to bringing an additional support to patients in therapy. A dog makes it possible to create an indispensable connection between the therapist and the patient, because essentially, after exposure to the dog, the patient is more relaxed and thus more able to take advantage of any therapeutic benefits.

Future studies could look at the reasons why men benefited more from the presence of the dog compared to the women. It would also be pertinent to determine if animal-assisted therapy has a major impact on therapeutic treatment compared to a classic treatment. To determine the effect of TAA on anxiety symptomatology, randomized control groups and a greater number of subjects should be used. Other objective outcome measures such as the cortisol levels or blood pressure could be used to confirm changes at different times throughout the day. In addition, it would be interesting to know if the decrease in anxiety could be reduced and maintained over time. In this study, the subjective nature of the outcome measure to evaluate anxiety could have been a bias. Potentially, animal-assisted therapy coupled with cognitive behavioral therapy may confer benefits more quickly compared to standard cognitive behavioral therapy.

Financial sources

The study was conducted using the human resources coming from the regular budget of the SPDM.

Conflict of interest

The authors report there was no conflict of interest.

Additional comments

All authors contributed equally to this article. Fabienne Giuliani collaborated on creating the protocol, conducted the trials with the patients and writing the article. Morgane Jacquemettaz contributed through scientific research, developing the overview and writing the article.

Acknowledgments

We are extremely grateful to all the patients who participated in the study. The patients created a privileged connection with the dog to the extent that they continue to ask to see him after the study and bring him treats. We also thank Mr. Medhi Mohammad Gholamrezaee, a statistician at the CHUV, for his additional analyses.

Appendix A

A linear regression model adjusted on the observed STAI scores after the first session for each patient were compared between patients recieving AAT at the first therapy and patients with ordinary therapy. This result is adjusted for gender and age and seems to confirm that AAT reduces the STAI scores almost significantly at the first session.

1. > summary(lm(saitsum ~ factor(Setting) + factor(Sexe) + Age,data = all.data.after.first.session))

Call:

lm(formula = saitsum ~ factor(Setting) + factor(Sexe) + Age, data = all.data.after.first.session)

Residuals:

Min	1Q	Median	3Q	Max
−19.5924	−4.5824	−0.5754	3.4629	15.8843

Coefficients:

	Estimate	Std. Error	t value	Pr(> |t|)
(Intercept)	56.94522	3.55821	16.004	< 2e-16 ***
factor(Setting)sc	4.02413	2.03407	1.978	0.0543.
factor(Sexe)masculin	−5.36982	2.01755	−2.662	0.0109 *
Age	−0.13508	0.09111	−1.483	0.1455

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 6.886 on 43 ° of freedom
Multiple R-squared: 0.2324, Adjusted R-squared: 0.1788
F-statistic: 4.339 on 3 and 43 DF, p-value: 0.009308

The second and third models are linear mixed effect models (Pinheiro J, Bates D, DebRoy S, Sarkar D and R Core Team (2017). _nlme: Linear and Nonlinear Mixed Effects Models_.R package version 3.1-131, URL: https://CRAN.R-project.org/package=nlme.), adjusted to measure the effect of AAT versus ordinary therapy on STAI scores measured at the end of each session for all sessions. The 3rd model is also adjusted for the STAI score before each session. Both models are adjusted for intercorrelation among observations corresponding to the same individual by including a random effect on the subject levels.

2. > summary(model.adjusted.on.both.session.after < −lme(saitsum ~ factor(Setting) + factor(Sexe) +factor(Protocole) + Age,data = all.data[all.data$Avant.après = ="après",],random = ~1|Subject))
Linear mixed-effects model fit by REML
Data: all.data[all.data$Avant.après = = "après",]

AIC	BIC	logLik
662.4736	680.1261	−324.2368

Random effects:
Formula: ~1 | Subject

	(Intercept)	Residual
StdDev:	6.126199	5.171875

Fixed effects: saitsum ~ factor(Setting) + factor(Sexe) + factor(Protocole) + Age

	Value	Std.Error	DF	t-value	p-value
(Intercept)	48.58808	3.824713	49	12.703717	0.0000
factor(Setting)sc	8.30144	1.083490	43	7.661759	0.0000
factor(Sexe)masculin	−3.79150	1.998469	49	−1.897202	0.0637
factor(Protocole)2	4.86195	2.008978	49	2.420111	0.0193
Age	−0.05266	0.089760	49	−0.586660	0.5601

Correlation:

	(Intr)	fctr(St)	fctr(Sx)	fc(P)2
factor(Setting)sc	−0.105			
factor(Sexe)masculin	−0.264	0.009		
factor(Protocole)2	−0.357	−0.026	0.046	
Age	−0.883	−0.015	−0.004	0.102

Standardized Within-Group Residuals:

Min	Q1	Med	Q3	Max
−2.1717321	−0.4896794	0.1075124	0.5369745	2.4104667

Number of Observations: 97
Number of Groups: 53

3. > summary(model.adjusted.on.both.session.after.adj.avant < −lme(saitsum ~ factor(Setting)+ factor(Sexe) + factor(Protocole) + Age + staisum_avant,data = all.data.apres,random = ~1|Subject))
Linear mixed-effects model fit by REML

Table A1
Comparison of the results obtained in the STAI scale between the Hoffman et al. study and our study.

	Control session		Animal-assisted session	
	Hoffman et al. [1]	Current study	Hoffman et al. [1]	Current study
Average score before the session	50.41 ± 10	57.5 ± 7.9	47.0 ± 11	54.6 ± 7.4
Average score after the session	48.0 ± 9	55.8 ± 7.9	42.2 ± 10	47.2 ± 8.9
	$Z = -0.981$ $p = 0.327$	$Z = -1.054$ $p = 0.295$	$Z = -2.402$ $p = 0.016$	$Z = -4.654$ $p < 0.0001$

Data: all.data.apres

AIC	BIC	logLik
591.2934	611.3803	−287.6467

Random effects:
Formula: ~1 | Subject

	(Intercept)	Residual
StdDev:	1.05702	4.676904

Fixed effects: saitsum ~ factor(Setting) + factor(Sexe) + factor(Protocole) + Age + staisum_avant

	Value	Std.Error	DF	t-value	p-value
(Intercept)	−2.187265	4.529154	49	−0.482930	0.6313
factor(Setting)sc	5.926250	0.976687	42	6.067707	0.0000
factor(Sexe)masculin	−0.751038	1.025123	49	−0.732631	0.4673
factor(Protocole)2	1.939223	1.023007	49	1.895610	0.0639
Age	0.031804	0.045217	49	0.703358	0.4852
staisum_avant	0.872599	0.069869	42	12.489128	0.0000

Correlation:

	(Intr)	fctr(St)	fctr(Sx)	fc(P)2	Age
factor(Setting)sc	0.098				
factor(Sexe)masculin	−0.311	−0.035			
factor(Protocole)2	0.045	0.010	−0.022		
Age	−0.512	−0.052	0.011	0.059	
staisum_avant	−0.906	−0.201	0.235	−0.208	0.166

Standardized Within-Group Residuals:

Min	Q1	Med	Q3	Max
−4.5296909	−0.2416064	0.1265629	0.5241319	1.7077864

Number of Observations: 97
Number of Groups: 53

Models were adjusted using the R environment for statistical computing version 3.4.0 (ref: R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.) and fundamental assumptions of each model were verified by graphical means.

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