distributed over three phases: pretest (15 min), test (20 min), and posttest or recovery period (15 min). Both the control group and the experimental group underwent the entire procedure following the same phases and the same cognitive tasks.

Pretest phase (Relaxation period). On the day of their appointment, the participants arrived individually to the laboratory where they were met by the experimenter. This individual handed out the informed consent form which included authorization for taking photos and videos for the purpose of lending credibility to the experimental scenario. Once this was done, the participants sat comfortably in front of the computer screen and watched a relaxing 10-min video designed to lower their activation state (Helland, 2016). On completion of this phase, the participants filled in the STAI-S questionnaire and their heart rate and blood pressure were recorded. These readings were used to establish the baseline of each individual for reference.

Test phase (Experimental phase). For this phase the participants moved to an adjacent room. Inside was a chair where they would take a seat and a camera in front of them which would record their performance on both tasks: a spoken task and a mental arithmetic task. The instructions provided were as follows:

"The first task you have to complete is a short speech for a job interview. Before starting your presentation, you have five minutes to mentally prepare a speech in which you describe in detail why you would be the best candidate for your ideal job. You have some blank pieces of paper and a pen should you wish to take some notes or draw diagrams to help organize your speech. However, you will not be able to use these notes later".

The experimenter left the room and this 5-min interval served as a pre-stress phase, a key step according to the first version of the TSST protocol (Kirschbaum, Pirke, & Hellhammer, 1993). Once this interval had elapsed, the experimenter entered the room again and relayed the following information:

"We're going to begin the task. Your responses will be recorded using the camera in front of you and you must talk in its direction. The recording of your intervention will be analyzed by faculty staff heading this research. Your time starts now".

The experimenter left the room again. Once the first task was completed (10-min speech), the participants moved immediately onto the second task with no rest period. The experimenter entered the room and gave the following instructions:

"The second task requires you to mentally continue a sequence of numbers. Starting from the number 1022, you must subtract 13 each time. You must give your answers out loud and if you make a mistake you must go back to the beginning, to the first number. Your time starts now."

The researcher remained in the room. If the participants made a mistake, the researcher stopped them and they would go back to the start. It was important that the experimenter have a sheet of paper at hand with the correct series of numbers written down in order to correct the mistakes as they happened. Nobody managed to complete the task within the allocated time.

Once both tasks were over, participants were asked to repeat the STAI-S questionnaire and their heart rate and blood pressure were recorded.

During this phase, the experimental group performed each task in the presence of a friendly dog and their carer (handler). The participants were informed that they could freely interact with the dog, stroking and petting it. The dog was positioned close to the participants' lap to facilitate interaction during the tasks. In the case of the control group, the participants were given a toy dog which they could hold during the tasks.

The participating dog was an eight-year-old friendly and trustworthy Golden Retriever, in order to promote a more fluid

social interaction with it. The animal was up to date on its vaccinations and had undergone a thorough veterinary checkup, adhering to a complete animal health protocol in order to ensure the dog's and the participants' health. An animal welfare protocol was drawn up to safeguard the dog's comfort. Several aspects were taken into account, including fatigue. The sessions were spread across two weeks (Week 1=7 sessions, Week 2=11 sessions), with a minimum rest period of 40 minutes and a maximum rest period of 60 minutes between sessions. The dog was always assisted by its handler (owner) who closely monitored the dog's well-being and behavior adapted to the requirements of the interaction protocol.

Posttest phase (Return to calm). Next, the pulse oximeter was removed and the participants were accompanied to the starting room. They were told that the tasks were over and that they would now watch the relaxation video again. Once that was done they were given the STAI-S questionnaire to complete for the last time. Their heart rate and blood pressure were recorded.

Data Analysis and Dependent Measures

A mixed factorial experimental design was used. The experiment conditions (experimental group and control group) and the time points that make up the study's experimental protocol (pretest, test, and posttest) were the factors identified. The first factor had two levels with between-group manipulation. The second factor had three levels with within-subject manipulation. The study's dependent variables were anxiety level, heart rate, and blood pressure levels (systolic and diastolic). These dependent variables were evaluated at the three time points: pretest, test, and posttest. The SPSS (version 22) statistical software was used for data analysis with a significance level set at 0.05.

Results

Table 1 shows the means and standard deviations of both groups (control and experimental) at each study phase (pretest, test, and posttest) for each dependent variable.

State anxiety: The mixed factorial Group x Phases analysis of variance (ANOVA) performed on the dependent variable State anxiety showed a significant main effect for the variable Phases, $F(2,68) = 43.236$, $p < .000$. The same occurred in the interaction Group x Phases, $F(2,68) = 3.951$, $p < .024$. The Group factor was not significant, $F(1,34) = 2.803$, $p < .103$. An analysis of the Group x Phases interaction in this study prompted the testing of the Group effect at each phase. To achieve this, the independent-samples t-test was used and the analyses revealed no between-group differences at pretest, $t(34) = -.65$, $p < .543$, $d=0.21$ (Cohen's d for effect size). Nor were there differences at posttest, $t(34) = 1.528$, $p < .136$, $d=0.51$. The between differences were observed at the test phase, $t(34) = 2.161$, $p < .038$, $d=0.72$. State-anxiety levels were lower in the experimental group compared to the control group (see Figure 1).

The Phases variable was significant for each group. Both groups' anxiety levels were higher at test compared to the other phases. Specifically, the control group yielded a significant effect for the Phases variable, $F(2,34) = 34.139$, $p < .000$. These data revealed a significant quadratic trend component, $F(1,17) = 40.020$, $p < .000$. A significant effect was also observed in the experimental group for the Phases variable, $F(2,34) = 12.260$, $p < .000$; the quadratic trend component was also significant, $F(1,17) = 20.365$, $p < .000$.

Table 1.

Descriptive statistics

	Group	M	SD
STAI-S_Pretest	C	11.89	5.476
	E	13.06	5.896
STAI-S_Test	C	28.83	9.593
	E	21.56	10.590
STAI-S_Posttest	C	15.44	5.913
	E	12.22	6.717
Heart rate_Pretest	C	75.722	10.4758
	E	74.778	10.0268
Heart rate_Test	C	96.944	12.4195
	E	89.044	11.2445
Heart rate_Posttest	C	77.500	10.6177
	E	72.000	7.9410
Systolic BP_Pretest	C	107.17	8.645
	E	109.39	6.260
Systolic BP_Test	C	109.32	26.867
	E	111.39	8.008
Systolic BP_Posttest	C	105.83	8.082
	E	105.11	5.860
Diastolic BP_Pretest	C	64.44	7.188
	E	64.44	6.233
Diastolic BP_Test	C	67.11	12.03
	E	66.89	6.738
Diastolic BP_Posttest	C	63.83	10.428
	E	63.94	6.384

Note: Descriptive statistics (Mean [M] and Standard deviation [SD]) for each group (Control [C] and Experimental [E]) across the different study phases (Pretest, Test, and Posttest) for each dependent variable (State anxiety [STAI-S], Heart rate, Systolic blood pressure, and Diastolic blood pressure.

Heart rate: The analysis of variance (ANOVA) performed on the dependent variable Heart rate showed a significant main effect for the variable Phases, $F(2,68) = 109.299$, $p < .000$. The same occurred with the Group x Phases interaction, $F(2,68) = 3.158$, $p < .049$. The Group factor was not significant, $F(1,34) = 2.354$, $p < .134$. An analysis of the Group x Phases interaction, which used the independent-samples t-test, revealed no significant differences at pretest, $t(34) = .276$, $p < .784$, $d = 0.09$, or posttest, $t(34) = 1.760$, $p < .087$, $d = 0.59$. Differences were found at the test phase, $t(34) = 2.041$, $p < .050$, $d = 0.67$. The average heart rate in the experimental group was lower compared to the control group (see Figure 2).

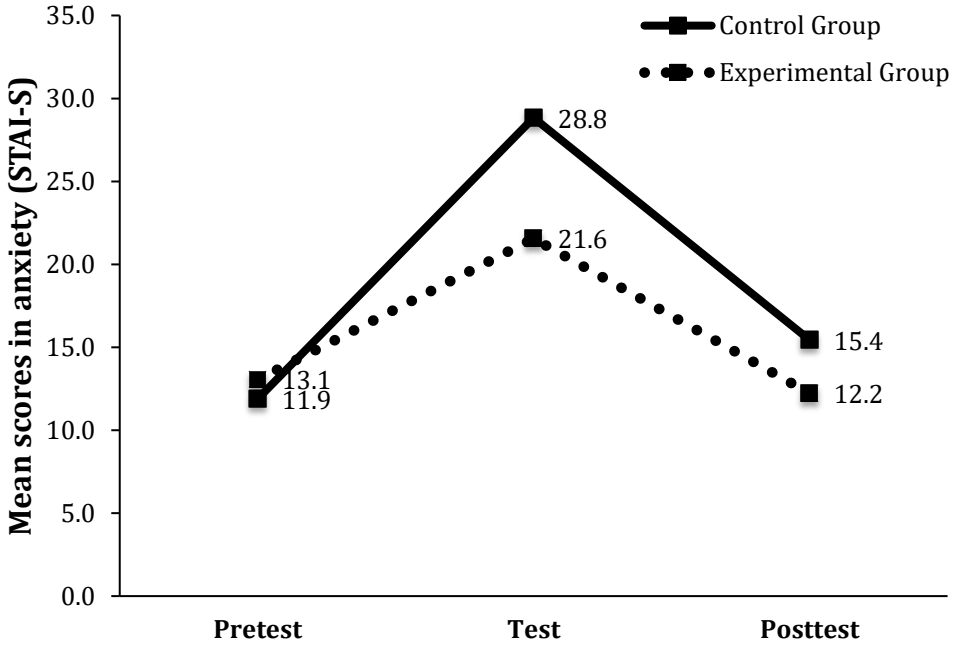

Figure 1. Mean values of state anxiety across the three phases (Pretest, Test, and Posttest) for each group.

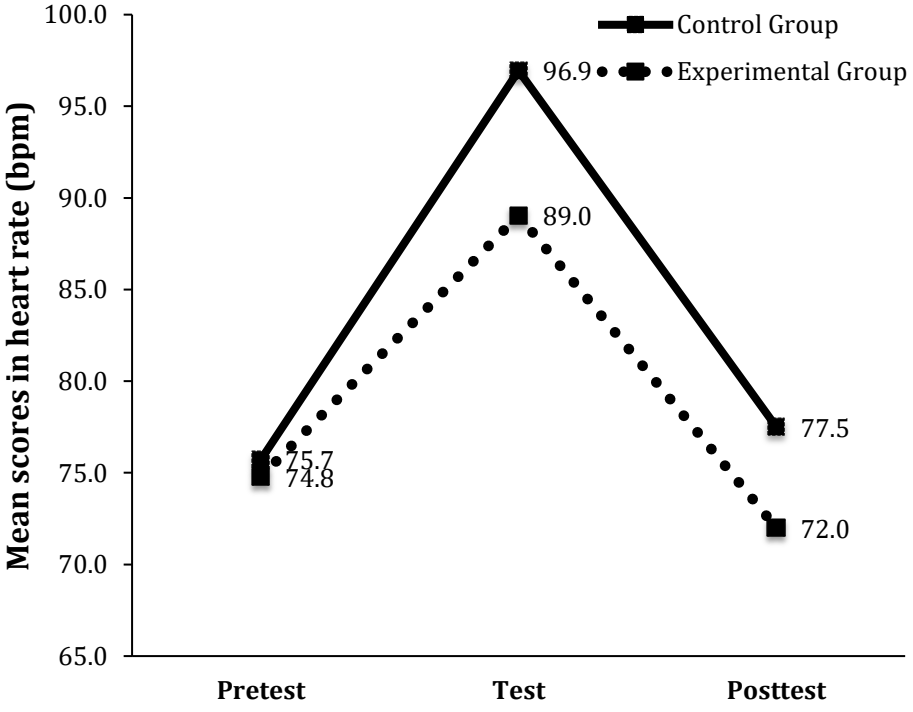

Figure 2. Mean values of heart rate (beats/min) across the three phases (Pretest, Test, and Posttest) for each group.

The Phases variable was significant for each group in the effects analysis. Both groups' heart rate was higher at test compared to the other phases. The control group yielded a significant effect, $F(2,34) = 63.217$, $p<.000$. These data revealed a significant quadratic trend component, $F(1,17) = 100.766$, $p<.000$. A significant effect was also observed in the experimental group for the variable Phases, $F(2,34) = 47.522$, $p<.000$, with a significant quadratic trend component, $F(1,17) = 75.708$, $p<.000$.

Systolic blood pressure: The corresponding analysis of variance (ANOVA) for this variable showed no significant effect in the Group variable, $F(1,34) = .244$, $p <.625$, nor in Phases, $F(2,68) = 1.260$, $p <.290$, or in the interaction between both variables, $F(2,68) = .144$, $p<.866$.

Diastolic blood pressure. The corresponding analysis of variance (ANOVA) for this variable showed no significant effect in the Group variable, $F(1,34) = 0.000$, $p <.987$, nor in Phases, $F(2,68) = 2,565$, $p <.084$, or in the interaction between both variables, $F(2,68) = 0.007$, $p<.993$.

Discussion and conclusions

The results of this study partially support the posed hypothesis. The experimental group's interaction with the dog would mitigate the participants' stress levels compared to the control group's interaction with the toy dog. Indeed, the participants in contact with the real dog showed lower levels of perceived anxiety and heart rate. In fact, the experimental group participants reported feeling less worried and nervous compared with their control group peers. The effect sizes were considerable in both dependent measures (state anxiety and heart rate; Cohen'd was 0,72 and 0,67, respectively), what encourages us to continue with this promising research project. However, no significant differences were found between the groups in terms of systolic and diastolic blood pressure.

These results are similar to those obtained by Wheeler and Faulkner (2015). Interacting with a dog while undertaking the TSST protocol significantly reduced the participants' degree of subjective anxiety compared to the group that did not avail of the dog's company. They also coincide with the results reported by Beetz et al. (2012). In this study, children with insecure attachment toward their parents largely benefited from a dog's company compared to the other groups when they took the adapted TSST test. This lends support to the idea that a dog can be a figure capable of providing psychophysiological benefits in stressful situations. In turn, and compared to the classical study proposed by Allen et al. (1991), no equivalent results were found for systolic and diastolic blood pressure. In this research, the experimental group showed significantly lower values than those of the other groups. Women who interacted with a dog exhibited lower stress levels compared to the group that remained alone or interacted with a friend. A possible explanation behind this difference could lie in the participants' degree of closeness with the dog. In their study, the participants completed the test joined by their own pet. However, the dog in the current study was unknown to the participants.

The results of this study also show differences and similarities to Polheber and Matchock's (2013) study, in which 294 university students engaged in the TSST protocol. The presence of a dog was compared to that of a friend or being alone. This research focused on identifying which type of company reports greater perceived (state anxiety) and psychophysiological (heart rate and cortisol level reduction) benefits. In this case, the presence of a dog reduced heart rate levels but not anxiety levels. This reaffirms that an animal's company can exert a positive effect on heart rate. Similar results were reported by Fiocco and Hunse (2017), who found that the presence of a dog significantly reduced the strength of the physiological stress response (electrodermal activity) when

exposed to a subsequent stressor. Additionally, the results of the current study do show also significant differences between both groups for perceived anxiety. The group that had the opportunity to interact with the dog reported lower state-anxiety levels. Grajfoner, Harte, Potter, and McGuigan (2017) demonstrated similar results. These authors confirmed that human–dog interaction reduces perceived anxiety levels. This positively impacts on a person's well-being and mood.

In short, the results partially support the hypotheses put forward. The animal's presence mitigated perceived anxiety and heart rate in a social stress situation (TSST). However, it did not have a significant effect on the measures of systolic and diastolic blood pressure. This allows us to suggest that the presence of a friendly dog has calming and dampening effects on social stress. Comparing these results with those of other studies which have introduced dogs that habitually live with the participants (pets) suggests that the effects can be strengthened further (Odendaal, 2000). Moreover, it would be interesting to allow the dog and participant more time to interact before entering the stressful situation. In line with Lass-Hennemann, Peyk, Streb, Holz, and Michael (2014), it is crucial to consider the type of contact that must be established between the participants and the dog to lessen the psychophysiological variables. As present study used a friendly dog, and not the participant's pet, more research will be necessary to analyse whether present results could be modulated by the type or the intensity of the human-animal bond.

Conneely and Hughes (2010) argue that the participation of university students in research studies is extremely useful when it comes to studying stress and anxiety. However, it would be desirable to use a wider sample that guarantees the confidentiality of the tasks included in the study. Another limitation to consider when interpreting these results could be sample size. If the number of participants per group is not very large, this can represent a limitation (Ato, López, & Banevente, 2013). This could explain why in the study of Wood et al. (2018) with 131 university students both the reduction of state anxiety and blood pressure were statistically significant. Similar results were found by Wheeler and Faulkner (2015) with 223 university students with respect to measurements of anxiety, heart rate, and blood pressure level. However, differences in the intensity of the stressful situation could not explain the lack of stress effects on blood pressure obtained in the present experiment, since an effect of dog interaction on this measure has been shown in previous studies with similar samples and experimental conditions (Wheeler & Faulkner, 2015; Wood et al., 2018).

In order to make improvements to the design of research studies that implement the TSST protocol, it would be interesting to add a group in which the participants were alone (no dog or toy dog). It would also be desirable to include other variables that might be related to human–animal interaction and the manifestations of stress; for example, cortisol levels (Barker, Knisely, McCain, & Best, 2005; Beetz et al., 2011) and oxytocin levels (Handlin, Nilsson, Ejdebäck, Hydbring-Sandberg, & Uvnäs-Moberg, 2012; Miller et al., 2009; Nagasawa et al., 2009).

To summarize, the results obtained are partially comparable to those achieved in previously conducted research (Beetz et al., 2012; Polheber & Matchock, 2013; Wheeler & Faulkner, 2015). A decrease in state anxiety and heart rate was observed in people who had the opportunity to interact with the friendly dog during the TSST protocol. Yet the results of this study are not comparable to earlier ones in which the animal's presence also had a significant effect on blood pressure (Allen et al., 1991). This could be due to the previously highlighted limitations. However, we can conclude that the results observed point to dogs being a source of social support when faced with conflict situations regardless of

the person's age. For this reason, we are seeing more studies attempt to demonstrate their benefits on people's health from a psychological, physiological, and social perspective.

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