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Beyond Direct Touch: Passive Canine Presence Is Associated with Lower Anxiety in South American University Students

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Abstract

University students are experiencing increasing levels of anxiety, attracting interest in accessible strategies that support wellbeing within educational settings. Animal-assisted interventions have shown beneficial effects on stress and anxiety in students. However, most studies have focused on direct and active interactions with dogs rather than their passive presence. This quasi-experimental study evaluated whether the presence of a dog during regular classroom activities was associated with reduced anxiety among university students. A total of 127 undergraduate students from Veterinary Medicine and Law programs at a Chilean university participated in a repeated-measures pretest–posttest design. State and trait anxiety were assessed before and after class using the Spanish version of the State-Trait Anxiety Inventory (STAI). Students attending classes with a dog present reported significantly lower state anxiety (0.300 ± 0.116 vs. 0.384 ± 0.139; $p < 0.001$) and trait anxiety (0.257 ± 0.140 vs. 0.352 ± 0.155; $p < 0.001$) than students in control classrooms (no dog present). Mixed-design repeated-measures ANOVAs revealed significant Time × Exposure interactions for both State Anxiety and Trait Anxiety, indicating different temporal anxiety trajectories between exposed and control students. These findings suggest that the passive presence of a trained dog may contribute to lower anxiety levels in university students and could represent a simple, feasible and low-resource wellbeing strategy, particularly relevant for higher education institutions in the context of Latin America and other Global South regions.

Keywords: animal-assisted intervention; dog-assisted intervention; anxiety; university students; Latin America

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1. Introduction

Mental health disorders among university students constitute a growing public health challenge worldwide [1]. University life exposes students to academic, social and financial stressors that negatively affect psychological wellbeing [2]. Evidence from the WHO World Mental Health International College Student Project showed that nearly one-third of first-year students met criteria for at least one mental disorder during the previous year, with anxiety among the most prevalent conditions [3]. These disorders are associated with poorer academic performance, reduced quality of life, and increased risk of dropping out of higher education. Given the increasing demand for mental health support in educational settings, universities have begun exploring complementary and scalable interventions that

can promote wellbeing outside traditional counselling services once the mental illness has been established. Among these approaches, Animal-Assisted Interventions (AAIs) have gained increasing attention in recent years. According to the International Association of Human–Animal Interaction Organizations, AAIs are goal-oriented interventions that intentionally incorporate animals into educational, health or social settings to improve human wellbeing [4].

Dogs are the species most frequently used in AAIs because of their sociability, trainability and capacity to establish positive interactions with humans. Previous studies suggest that dogs act as social facilitators, promote emotional regulation and improve perceptions of social support [5,6]. These effects are particularly relevant in higher education, where emotional wellbeing and social integration are important predictors of academic success [7]. Several physiological mechanisms may explain these benefits. For example, positive human–dog interactions have been associated with increased oxytocin release and reduced activation of stress-related physiological pathways, including lower cortisol concentrations, heart rate and blood pressure [5,8,9]. These findings suggest that companion animals can function as natural regulators of stress responses. Also, it has been demonstrated that even a brief 10-min interaction with therapy animals significantly reduced salivary cortisol levels among university students [10]. Similarly, improvements in mood, wellbeing and decreased anxiety have been reported following dog-assisted interventions [11], and reductions in perceived stress among undergraduates students participating in canine-assisted programs have also been documented [12]. More recent studies continue to support these findings. For example, undergraduate students exposed to therapy dogs during examination periods reported significantly higher positive affect scores than controls [13]. Also, reductions in momentary stress among undergraduate students have been reported while participating in animal-assisted interventions [14]. In addition, repeated access to therapy dogs over an academic semester reduced stress, depression and worrying feelings while improving self-compassion among first-year students [15]. The evidence from systematic reviews further supports the effectiveness that AAIs provide for consistent short-term reductions in anxiety among university students [16], or overall reductions in acute stress and anxiety across higher education populations [17].

Most evidence regarding animal-assisted interventions in higher education has been generated in North America, Europe and Australia, while studies conducted in Latin America and other Global South regions remain comparatively scarce [17,18]. This geographical imbalance limits understanding of whether the benefits reported elsewhere can be generalized across diverse educational, cultural and socioeconomic contexts. The issue is particularly relevant because universities in low- and middle-income countries frequently face increasing demands for mental health support while operating with constrained institutional resources [3,19]. In such contexts, low-cost and easily implemented interventions, such as AAIs, could represent valuable alternatives. However, important knowledge gaps remain. Most previous studies have focused on direct physical interactions with therapy dogs, such as petting or active activities [10,12]. Consequently, it is unclear whether the benefits result from physical contact, social facilitation or simply the presence of the animal. Many interventions have been evaluated in dedicated therapy spaces rather than in authentic educational settings, limiting their ecological validity [20].

Although direct interaction is considered a central component of many animal-assisted interventions, some evidence suggests that beneficial effects may not depend entirely on physical contact. For example, studies in university settings have reported reductions in anxiety and improvements in mood even under conditions involving limited engagement with animals, suggesting that visual exposure, proximity to the animal, or the broader social context associated with canine presence may contribute to student wellbeing [17,21].

However, the extent to which passive canine presence alone can influence anxiety remains insufficiently explored, particularly in naturally occurring educational environments.

Little is known about whether the passive presence of a dog, without active interaction, can reduce anxiety within authentic classroom environments. We hypothesized that university students exposed to the passive presence of a trained dog during class would report significantly lower anxiety levels than students attending comparable classes without canine exposure, regardless of academic discipline. Additionally, we expected that this effect would be achieved without the need for direct interaction between students and the animal.

2. Materials and Methods

2.1. Study Design

A quasi-experimental study with a repeated-measures pretest–posttest design was conducted to evaluate the effect of the passive presence of a dog in the classroom on anxiety levels among university students. The study compared students exposed to the presence of a dog during a regular class session with students attending the same academic activities without exposure to a dog. In the intervention condition, a trained dog remained quietly present in the classroom throughout the session without structured activities or direct interaction with students; a detailed description of the procedure is provided in Section 2.4. Measurements were obtained at the beginning and at the end of each class session, allowing assessment of short-term changes in anxiety levels associated with the intervention. Additionally, the study incorporated students from two academic programs, Veterinary Medicine and Law, to explore whether the effect of the intervention differed according to academic background.

2.2. Study Setting

The study was carried out at the Providencia Campus of Universidad de Las Américas, Santiago, Chile, during September and October 2025. All interventions and assessments took place in the students' regular classrooms during scheduled academic activities. No modifications were made to the course curriculum, teaching methodology or duration of the classes, thus ensuring that the intervention was evaluated under ecologically valid educational conditions.

2.3. Participants

Participants were undergraduate students enrolled in Veterinary Medicine and Law courses. Four class sections were selected for participation: one exposed section and one control section (non-exposed) from each academic program. A total of 127 students participated in the study, including 65 Veterinary Medicine students and 62 Law students. Participation was voluntary and all participants provided informed consent before enrolment. Students were eligible to participate if they were at least 18 years of age, regularly enrolled in the selected courses, present for the entire class session and able to complete the Spanish version of the study questionnaire. Individuals reporting dog allergies, cynophobia, any medical or psychological conditions that could interfere with participation were excluded from the study. Students who failed to complete either the pre-intervention or post-intervention assessment were also excluded from the final analysis.

2.4. Intervention

The intervention consisted of the passive presence of a dog in the classroom. The animal had been habituated to academic environments from an early age and routinely accompanied the principal investigator during educational activities. Prior to participation,

the dog had up-to-date vaccination, deworming and veterinary health certifications. At the beginning of each session, participants completed the pre-test assessment. Immediately afterward, the dog was introduced into the classroom accompanied by its handler and positioned in a visible area of the room. During the intervention period, the dog remained calm and inactive, typically resting or sleeping, without engaging in direct interaction with the students. No active activities involving the dog were implemented and students were not encouraged to pet, feed, play with or otherwise interact with the dog. The dog remained in the classroom throughout the central portion of the class and was removed shortly before administration of the post-test questionnaire.

2.5. Control Condition

Students assigned to the control condition attended their classes under normal academic circumstances and followed the same assessment schedule as the intervention group. No dog was present during these sessions. This approach allowed comparison between typical classroom conditions and classroom conditions that included the passive presence of a dog.

2.6. Measurement of Anxiety

Anxiety was evaluated using the Spanish version of the State-Trait Anxiety Inventory (STAI), one of the most widely used instruments for the assessment of anxiety in research and clinical settings [22]. The instrument comprises two subscales: State Anxiety (STAI-S), which assesses temporary anxiety associated with a specific situation, and Trait Anxiety (STAI-T), which evaluates a more stable tendency to experience anxiety.

The questionnaire was administered electronically using a digital platform (Google Forms®) accessed through a QR code. Participants completed the instrument individually and anonymously at two time points: immediately before the intervention or control condition (T0) and immediately before the end of the class session (T1). State and Trait Anxiety scores measured at T0 and T1 constituted the primary outcome variables. Repeated measurements were analysed directly to examine the effects of time, exposure condition and academic program on anxiety levels.

2.7. Study Procedures

Before data collection, authorization was obtained from university authorities and course instructors. At the beginning of each session, students received a brief explanation of the study objectives and procedures and subsequently provided informed consent. Baseline anxiety was then assessed using the STAI. In exposed classrooms, the dog entered the room only after completion of the baseline assessment, thereby preventing its presence from influencing the initial measurement. Classes subsequently proceeded according to their regular academic activities. In exposed groups, the dog remained quietly present throughout the session without direct interaction with students. Shortly before the conclusion of the class, the dog was removed from the classroom, and participants completed the post-intervention questionnaire. To minimize habituation effects and the development of attachment between students and the animal, each class section was exposed to the intervention on a single occasion only. The professor did not intervene during the process, although was present in the classroom. One member of the research team was responsible for sharing the QR before and after dog exposure.

2.8. Variables

The principal independent variable was exposure to the dog, categorized as exposed or unexposed. Academic program (Veterinary Medicine or Law) was included as a second

between-subject factor. Time of assessment constituted the within-subject factor with measurements obtained at T0 and T1.

The main dependent variables were the State Anxiety and Trait Anxiety scores derived from the STAI. Anxiety scores recorded at T0 and T1 were used to evaluate temporal variation in anxiety levels and to assess the potential influence of exposure condition and academic program.

2.9. Bias Control

Several procedures were implemented to reduce potential sources of bias. Assessments were conducted at equivalent moments during the class sessions across all groups. The same dog, handler, classroom protocol and exposure duration were used throughout the study. The class consisted of a one-hour lecture and the classroom protocol consisted of checking assistance by the professor before starting the lecture and then presenting the research team and answering the pre-exposure questionnaire and finally starting the lecture. The dog was positioned at the front of the room so all of them could see the dog. Students were not informed of the specific study hypothesis, thereby reducing expectation effects. Direct interaction between participants and the dog was avoided as much as possible to isolate the effect of the animal's passive presence. Furthermore, the intervention was delivered only once in each section to minimize habituation and bonding effects that could influence participant responses.

2.10. Ethical Considerations

The study was conducted in accordance with ethical principles governing research involving human participants and the welfare of animals involved in educational and scientific activities. Participation was voluntary and anonymous, and students could withdraw from the study at any time without academic consequences. Animal welfare considerations were incorporated throughout the study. The dog underwent regular veterinary monitoring and remained under the supervision of an experienced handler during all interventions. Exposure periods were limited in duration, and no forced interactions with participants were permitted. Procedures were also established to address potential discomfort, allergic reactions, or concerns expressed by students. Approval was obtained from the Institutional Ethic Committee of Universidad de Las Américas, Chile (Protocol N° CEC_FP_2025047).

2.11. Statistical Analysis

Separate mixed-design repeated-measures analyses of variance (ANOVAs) were conducted for State Anxiety (STAI-S) and Trait Anxiety (STAI-T). Time (pre-class [T0] vs. post-class [T1]) was specified as the within-subject factor, while Exposure Group (dog present vs. dog absent) and Academic Program (Veterinary Medicine vs. Law) were included as between-subject factors. The analyses evaluated the main effects of Time, Exposure Group, and Academic Program, as well as all two-way and three-way interactions. Effect sizes were quantified using partial eta-squared (ηp^2) and are reported alongside F statistics and *p*-values. Prior to analysis, assumptions of normality and homogeneity of variance were assessed through graphical inspection of residuals and Levene's tests, as appropriate. Because the within-subject factor (Time) contained only two levels, the assumption of sphericity was inherently satisfied. To further characterize temporal responses, pre–post change scores (Δ = T1 − T0) were calculated for both State Anxiety and Trait Anxiety. Separate two-way ANOVAs were subsequently conducted using Exposure Group and Academic Program as between-subject factors. These complementary analyses were performed to facilitate interpretation of changes in anxiety across the intervention period. Estimated marginal means and 95% confidence intervals were calculated to describe anxiety

levels across experimental conditions. Statistical significance was established at $p < 0.05$. All statistical analyses were conducted using Jamovi version 2.7.

3. Results

3.1. Participant Characteristics

A total of 127 undergraduate students participated in the study, including 65 Veterinary Medicine students and 62 Law students. Mean age differed significantly between academic programs (t = 3.76, df = 125, $p < 0.001$) with Veterinary Medicine students being younger (23.7 ± 4.06 years) than Law students (29.5 ± 11.7 years). However, age differences did not impact baseline anxiety levels between academic programs. No significant differences were detected in trait anxiety (t = −1.20, df = 125, $p = 0.233$) or state anxiety (t = −1.31, df = 125, $p = 0.194$) between Veterinary Medicine and Law students. Mean baseline trait anxiety scores were 0.328 ± 0.157 and 0.295 ± 0.154 for Veterinary Medicine and Law students, respectively, while mean state anxiety scores were 0.363 ± 0.133 and 0.332 ± 0.138.

3.2. Omnibus Mixed-Design ANOVA

3.2.1. Trait Anxiety

A significant main effect of Exposure Group was observed ($F_{(1123)} = 7.06$, $p = 0.011$, $\eta p^2 = 0.122$), indicating that students exposed to the dog reported lower Trait Anxiety scores overall than control participants. No significant main effect of Academic Program was detected ($F_{(1123)} = 0.65$, $p = 0.423$, $\eta p^2 = 0.013$). A significant Time × Exposure interaction was identified ($F_{(1123)} = 5.79$, $p = 0.020$, $\eta p^2 = 0.102$), indicating that changes in Trait Anxiety over time differed between exposed and control groups. A significant Time × Academic Program interaction was also observed ($F_{(1123)} = 4.77$, $p = 0.034$, $\eta p^2 = 0.085$). The three-way interaction among Time, Exposure Group and Academic Program was not significant ($F_{(1123)} = 0.10$, $p = 0.749$, $\eta p^2 = 0.002$).

3.2.2. State Anxiety

For State Anxiety, the mixed-design ANOVA revealed a significant main effect of Exposure Group ($F_{(1123)} = 6.98$, $p = 0.011$, $\eta p^2 = 0.120$), demonstrating overall lower State Anxiety scores among students exposed to the dog compared to those unexposed. Academic Program was not associated with significant differences in State Anxiety ($F_{(1123)} = 0.94$, $p = 0.338$, $\eta p^2 = 0.018$). A significant main effect of Time was identified ($F_{(1123)} = 5.22$, $p = 0.027$, $\eta p^2 = 0.093$) indicating a change in anxiety levels across the classroom session. The Time × Exposure interaction was significant ($F_{(1123)} = 5.02$, $p = 0.029$, $\eta p^2 = 0.090$) showing that temporal changes differed between exposed and unexposed groups. The Time × Academic Program interaction was also significant ($F_{(1123)} = 5.27$, $p = 0.026$, $\eta p^2 = 0.094$). No significant three-way interaction was detected ($F_{(1123)} = 1.68$, $p = 0.201$, $\eta p^2 = 0.032$.

3.3. Influence of Academic Program

Although significant Time × Academic Program interactions were detected for both anxiety measures, the main effect of Academic Program was not significant for either Trait Anxiety ($F_{(1123)} = 0.65$, $p = 0.423$) or State Anxiety ($F_{(1123)} = 0.94$, $p = 0.338$). These results suggest that overall anxiety levels were comparable between Veterinary Medicine and Law students, despite differences in age between academic programs.

3.4. Mean Anxiety Scores Across Exposure Conditions

Estimated marginal means showed consistently lower anxiety levels in students attending classrooms where a dog was present. For Trait Anxiety, mean adjusted scores were lower in exposed Law students (0.243; 95% CI: 0.183–0.303) and exposed Veterinary Medicine students (0.267; 95% CI: 0.214–0.321) than in their respective unexposed groups. Similarly, for State Anxiety, lower adjusted scores were observed among exposed Law students (0.276; 95% CI: 0.223–0.328) and Veterinary Medicine students (0.320; 95% CI: 0.273–0.366) compared with unexposed classrooms. The temporal changes in State Anxiety according to exposure conditions are illustrated in Figure 1.

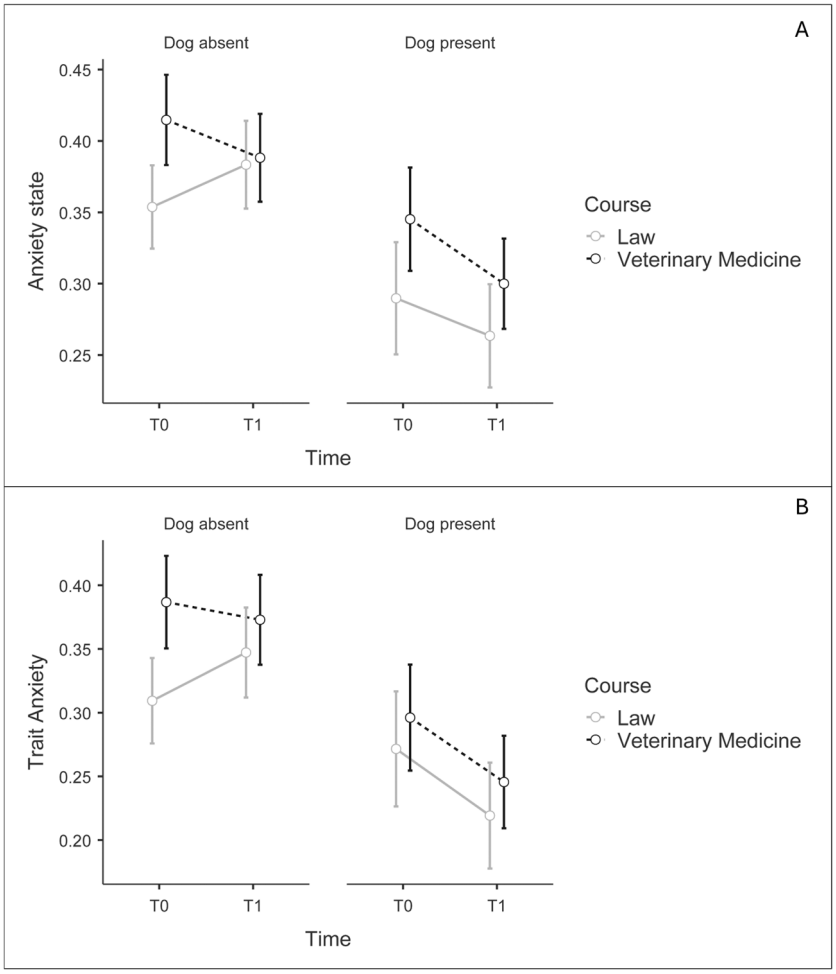


Figure 1. Mean anxiety scores before (T0) and after (T1) the classroom session according to exposure condition and academic program. Panel (**A**) presents State Anxiety (STAI-S) and Panel (**B**) presents Trait Anxiety (STAI-T). Solid lines indicate Law students and dashed lines indicate Veterinary Medicine students. Exposed groups attended classes with the passive presence of a dog, whereas control groups attended classes without canine exposure.

3.5. Descriptive Changes Between Pre- and Post-Class Assessments

For State Anxiety, Law students exposed to a dog showed a reduction from 0.290 before class to 0.263 after class, whereas Veterinary Medicine students showed a reduction from 0.345 to 0.300. In contrast, Law students in the unexposed condition exhibited a slight increase from 0.354 to 0.383, while Veterinary Medicine unexposed students showed only a small reduction from 0.415 to 0.388. A similar pattern was observed for Trait Anxiety. Among Law students exposed to a dog, scores decreased from 0.272 to 0.219, whereas Vet-

erinary Medicine student scores decreased from 0.296 to 0.246. Changes among unexposed groups were smaller and less consistent.

3.6. Analysis of Pre–Post Changes Scores

To further evaluate temporal responses, change scores (Δ = T1 − T0) were calculated for each participant. Separate two-way ANOVAs were performed for State Anxiety and Trait Anxiety using Exposure Group (dog present vs. absent) and Academic Program (Veterinary Medicine vs. Law) as between-subject factors. For State Anxiety, significant effects of Exposure Group ($F_{(1123)} = 13.39$, $p < 0.001$, $\eta p^2 = 0.090$, and Academic Program ($F_{(1123)} = 2.04$, $p = 0.016$, $\eta p^2 = 0.094$) were observed. The interaction between Exposure Group and Academic Program was not significant ($F_{(1123)} = 1.68$, $p = 0.201$, $\eta p^2 = 0.032$). For Trait Anxiety, significant effects of Exposure Group ($F_{(1123)} = 5.79$, $p = 0.020$, $\eta p^2 = 0.102$) and Academic Program ($F_{(1123)} = 4.77$, $p = 0.034$, $\eta p^2 = 0.085$) were detected. The interaction between Exposure Group and Academic Program was not significant ($F_{(1123)} = 0.10$, $p = 0.749$, $\eta p^2 = 0.002$).

4. Discussion

The present study evaluated the effect of the passive presence of a dog in the classroom on anxiety levels among university students. The findings support the study hypothesis, demonstrating that students exposed to the dog reported significantly lower state and trait anxiety scores compared with students attending comparable classes without canine exposure. These findings are consistent with previous evidence indicating that animal-assisted interventions (AAIs) can reduce anxiety and stress while improving psychological wellbeing among university students [6,10–12,15,17,18].

The present results should also be considered in relation to the limited literature evaluating low-contact or non-contact forms of animal-assisted intervention. While most studies have involved active interaction with therapy dogs, previous work has shown that psychological improvements can occur across different levels of human–animal engagement. For example, a study reported reductions in anxiety even among participants exposed only to dog-related visual stimuli, although larger effects were observed when direct interaction occurred [21]. Similarly, systematic reviews indicate that substantial methodological heterogeneity exists regarding the amount of physical contact required to produce beneficial outcomes, and the specific contribution of passive animal presence remains poorly understood [17,18]. Within this context, the present study contributes novel evidence suggesting that canine presence in a classroom environment may be associated with lower anxiety levels even when interaction is intentionally minimized.

The present findings extend previous research by suggesting that lower anxiety levels may be observed even when direct interaction between students and dogs is intentionally minimized. Most studies conducted in university settings have evaluated interventions involving petting, playing, grooming, or other forms of active engagement with therapy animals. As a result, it has remained unclear whether the reported benefits arise primarily from physical contact, from broader psychosocial processes associated with animal presence, or from a combination of both. Importantly, significant Time × Exposure interactions were observed for both State Anxiety and Trait Anxiety, indicating that changes across the classroom session differed between exposed and unexposed students. Although the quasi-experimental nature of the study limits causal inference and baseline group differences cannot be completely excluded, these findings provide evidence that the temporal trajectory of anxiety was influenced by exposure condition.

Several mechanisms may explain the observed effects. Human–animal interaction research suggests that companion animals can act as social facilitators and sources of emo-

tional support, promoting feelings of comfort, security and social connectedness [5,23]. According to [5], positive interactions with dogs are associated with increased oxytocin release and reduced activation of physiological stress pathways, including lower cortisol concentrations, blood pressure and heart rate. Similarly, studies have reported neurophysiological changes associated with affiliative behaviour between humans and dogs [9].

Another explanation may involve the concept of non-evaluative social support. Academic environments often expose students to continuous demands, performance evaluation, social comparison and uncertainty regarding academic achievement, all of which can contribute to elevated anxiety levels [3,24]. Animals may provide a unique source of social support because they are perceived as predictable, accepting and free from judgment [5]. Consequently, the calm and passive presence of the dog in the classroom may have contributed to creating a more emotionally supportive learning environment, thereby attenuating anxiety responses associated with academic activities.

An important contribution of the present study is its ecological validity. A common criticism of the AAI literature is that many interventions are conducted during dedicated therapy sessions, wellness events, or specially organized activities that differ substantially from everyday academic experiences [10]. The need for studies evaluating animal-assisted interventions under realistic conditions while controlling for novelty and contextual effects have been empathized by [25]. Unlike many previous studies, the present intervention took place during regular classes without altering teaching methodology, course content or class structure. Therefore, the results provide evidence that the beneficial effects of canine presence extend beyond dedicated therapy settings and can occur within authentic educational environments.

An additional contribution of the present study is its relevance within the context of Latin America and the Global South. Most evidence regarding animal-assisted interventions in higher education originates from North America, Europe and Australia, where universities often have greater access to mental health resources, counselling services and formal wellbeing programs [17,26]. By contrast, many higher education institutions in Latin America face increasing mental health demands while operating under resource constraints and limited availability of psychological services [3,24]. Consequently, there is a need for innovative, low-cost and scalable interventions capable of supporting student wellbeing without requiring extensive infrastructure or specialized personnel. The present study contributes to addressing this gap by providing empirical evidence from a Chilean university, a geographic region that remains underrepresented in the animal-assisted intervention literature [17].

Cultural and institutional differences may influence the effectiveness, acceptance and implementation of animal-assisted interventions across regions. Most published studies evaluating animal-assisted interventions in higher education have been conducted in North America, Europe, and Australia [10,17,27]. Consequently, evidence from Latin America and other Global South regions remains comparatively limited. Expanding research into underrepresented educational and cultural contexts is important for determining whether findings observed elsewhere can be replicated across diverse university populations and institutional settings. The present study contributes to this objective by providing evidence from a Chilean university context.

The absence of significant interactions between academic program and exposure status further supports the robustness of the intervention. Although Veterinary Medicine students were significantly younger than Law students, baseline anxiety levels did not differ between programs, and both groups exhibited similar responses to the presence of the dog. This interpretation is consistent with previous studies reporting beneficial effects of animal-assisted interventions across diverse university populations and among individuals

with varying levels of prior experience with companion animals [14,26]. In addition, it has been proposed that responses to animals may be mediated by broad affiliative and social processes rather than exclusively by familiarity or previous exposure to animals [28]. Such mechanisms may help explain the similar patterns observed across academic disciplines in the present study.

However, significant Time × Academic Program interactions were observed for both State and Trait Anxiety. This finding suggests that anxiety trajectories during the class session were not identical across academic disciplines. Although the present study was not specifically designed to identify the underlying causes of these differences, variations in teaching methods, course content, academic demands, classroom climate, or students' expectations may partially explain these patterns. The previous literature has shown that discipline-specific educational experiences can influence students' psychological responses to academic environments. Importantly, because the three-way interaction involving Exposure Group was not significant, these differences do not appear to alter the overall beneficial association observed between canine presence and anxiety reduction. The tendency for exposed students to exhibit reduced anxiety across the classroom session while control students remained stable or increased slightly is also consistent with previous investigations. Indeed, a significantly higher positive affect scores among students exposed to therapy dogs during examination periods compared with control participants have been documented [13]. Similarly, reductions in momentary stress following animal-assisted interventions particularly among students experiencing elevated baseline stress have been observed [14].

The reduction observed in trait anxiety should be interpreted cautiously. Trait anxiety is traditionally conceptualized as a relatively stable personality characteristic that is not expected to change substantially following a brief intervention [13]. Therefore, it is unlikely that a single classroom session fundamentally altered participants' underlying anxiety disposition. A more plausible explanation is that the reduction in state anxiety influenced self-perceptions at the time of questionnaire completion, generating more positive responses on trait-related items. Similar methodological concerns have been raised in previous studies evaluating short-term psychological interventions and self-reported outcomes [17,18]. Consequently, the findings related to state anxiety are likely to provide the strongest evidence of effectiveness of intervention. Several limitations should be acknowledged. First, anxiety was evaluated exclusively through self-reported measures, which may be susceptible to reporting bias, social desirability effects and transient emotional states. Previous studies have demonstrated the value of incorporating physiological indicators such as salivary cortisol, heart rate variability, blood pressure and electrodermal activity to better characterize the mechanisms underlying animal-assisted interventions [16,19,29]. Second, the quasi-experimental design did not allow random allocation of participants, thereby limiting causal inference and increasing the possibility of uncontrolled confounding factors. Similar methodological limitations have been identified in previous reviews of the field [10,17,18,30]. Third, only one dog participated in the intervention, preventing assessment of how individual animal characteristics such as breed, age, temperament, training or handler–animal relationship may influence outcomes. This limitation has been highlighted in previous systematic reviews that recommend greater standardization of dog intervention protocols [17,18,30]. Also, the present study focused on anxiety outcomes and the introduction of dogs into classroom environments may also generate unintended effects. For some students, the presence of an animal could act as a source of distraction, interfere with concentration or modify classroom dynamics in ways that negatively affect learning outcomes. Future research should evaluate both psychological indicators and objective measures of academic performance to better understand the potential educational

impact of classroom-based animal-assisted interventions. Finally, the study evaluated only immediate short-term effects and did not include follow-up assessments.

Future research should employ randomized controlled designs involving larger and more diverse student populations across multiple institutions. In addition, future investigations should include physiological biomarkers such as cortisol, heart rate variability, blood pressure and oxytocin measurements to further elucidate the psychobiological mechanisms responsible for the anxiolytic effects observed in AAIs [5,19,23]. Longitudinal studies examining repeated exposure throughout an academic semester would also be valuable. Previous studies suggest that repeated access to therapy dogs may reduce stress, depression and worrying feelings while increasing self-compassion and wellbeing over time [6,10]. However, the long-term durability of these benefits remains insufficiently understood [18]. Finally, comparative studies directly evaluating passive canine presence versus active dog–student interaction would provide critical insights into the mechanisms underlying intervention effectiveness. Most published work have focused on interaction-based approaches [10–12,16,23], whereas the present study suggests that passive exposure alone may generate meaningful benefits.

5. Conclusions

The results indicate that the passive presence of a dog in the classroom was associated with more favourable changes in anxiety across the classroom session, even in the absence of direct interaction. Significant Time × Exposure interactions observed for both State and Trait Anxiety suggest that students exposed to the dog experienced different temporal anxiety trajectories than those in control classrooms. These findings are particularly relevant for universities in Latin America and other Global South regions, where growing demand for mental health support often coexists with limited institutional resources. Under these conditions, interventions that are simple, low-cost and easily integrated into existing educational activities may offer a valuable complement to student wellbeing initiatives.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data is available under petition to the authors.

Conflicts of Interest: The authors declare no conflicts of interest.

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