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Final Year Project Report

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**Humans’ empathetic experiences with dogs and their ability to correctly understand dogs’ communicative behaviours**

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**Statement of originality:**

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**Abstract**

The communication between heterospecific individuals is quite complex process, and such example is the inter-dependent relationship present in domestic dogs *(Canis familiaris)* and humans, due to the long co-habitation process in the last few decades. This relationship has received much research attention in the animal cognition area, due to dogs’ unique social learning abilities within the non-primate species. However, less is known how humans interpret dogs’ behaviour and what are the major factors affecting this peoples’ ability. In this study 52 participants were tested in relation to their ability to correctly recognize dogs’ behaviour, their empathy level, and their personal experience with dogs. Major condition of their selection was their dog ownership. Thus, half of them were dog-owners and the rest were people who do not own dogs. Two self-report questionnaires were performed to quantify the empathy level, the correct interpretation of dogs’ behaviour and the personal experience with dogs of each participant. Further analysis took place to identify the potential effects of humans’ empathy, dog-ownership, and personal experience on the understanding of canine behaviour. Overall, the results showed no significant relationship between these three factors and the humans’ interpretation of dog behaviour. However, it is suggested that there are potential in-between effects. Therefore, examination of those factors as a group, instead of a single one at a time, will be more efficient in this case. Finally, as dogs play a major role in humans’ everyday life now, further research is recommended, in order to better identify methods of improvement of the communicative interactions between humans and dogs.

**1- Introduction**

1.1 Dog-human relationship

As recently as the last few decades dogs have gone from being ‘outdoor’ animals to become welcomed inside peoples’ homes and integrated into being one of the family (Klein, 2016). Time spent together and in proximity has increased, as have the bonds between the human and the pet (McBride, 1995). However, dog-human relationships are quite complex and not everybody can understand what dogs want and feel. In particular, domestic dogs (*Canis familiaris*) have become popular model animals in comparative cognition research (Miklósi, 2014). It is proven that dogs are unique among other domesticated species, because of their abilities to socialize to humans as their natural process and to behave analogous to the corresponding human traits (Topál et al., 2009). Additionally, dogs show empathy to different emotional stages of humans, such as distress (Custance & Mayer, 2012; Silva & de Sousa, 2011). They can also discriminate emotional expressions of human faces (Müller et al., 2015). However, for an effective communication, people need to understand dogs’ modes of communicating as well. There are different factors, which might affect this human ability. Theoretically, people who own dogs for a long time ought to be better able to understand their behaviour and may be more empathetic to dogs, in contrast to people who have never had one. Therefore, dog ownership and empathy might be critical factors of the dog-human communication. In addition, people with greater experience with dogs, in theory, are better in the interpretation of canine behaviour. Thus, personal experience with dogs might be another critical factor.

1.2 Human empathy and dogs’ behaviour/emotions

1.2.1. Human-dog empathy research

Empathy and the ability to correctly understand a behaviour are subjective terms. This means that they might be difficult to be defined and proven for each individual. In particular, people tend to perceive human’s and dogs’ facial expressions using the same manner, and that psychological factors, especially empathy, affect both their speed and intensity of rating dogs’ emotional facial expressions (Kujala et al., 2017). Additionally, empathy was the best predictor of how Norwegian dog owners rated pain in dogs (Ellingsen et al., 2010). However, other processes are also involved when observing animals in pain (Ellingsen et al., 2010). Alternatively, dogs have the ability to behave empathetically to human distress and also to conspecifics (Quervel-Chaumette et al., 2016; Szantho et al., 2017). Therefore, empathy is a potential factor, which affects the dog-human communication. In addition, dogs respond differently to peoples’ emotional expressions, and may have an aversion to human expressions of sadness, which is a possible indicator of an emotional contagion, which is a form of rudimentary empathy (Yong, 2014). Even though there is a lot of research done on dogs’ empathy towards human emotions, humans’ empathy, and humans’ ability to correctly understand dogs’ behaviours it is not tested specifically (Joly-Mascheroni et al., 2008; Sanford et al., 2018; Sümegi et al., 2014). Dogs are not expected to have similar characteristic and behavioural responses to humans, consequently the way they express their emotions and needs is different. It is practically much more complex to understand dogs’ behaviour than expected. Thus, empathy is suggested to be a major factor in humans’ interpretation of canine behaviour and intense research of this relationship is essential.

1.2.2 Measuring empathy in people

Empathy plays a key role in peoples’ everyday communication; therefore, an accurate method of measuring empathy is essential. There are three major types of methods being used in measuring empathy- self-report on picture stories, on questionnaires, and in stimulated experimental situations (Zhou et al., 2003). In particular, the Empathy Quotient (EQ) is widely used self-report scale designed to provide an empirical measurement of humans’ empathy, and its validity is fully proven (Lawrence et al., 2004). This questionnaire is an appropriate measure of the construct of empathy in people and is being used in assessing the level of social impairment in certain disorders like Autism as well (Allison et al., 2011; Baron-Cohen & Wheelwright, 2004). Additionally, the assessment of empathy via self-report along with behavioural paradigms is also proven effective; however the behavioural paradigm is suggested to be used only for specific research questions, due to its cover of distinct endophenotypes (Melchers et al., 2015). Nevertheless, future research using a multimethod approach combining self-report, behavioural, and psychophysiological measurements have the potential to significantly broaden and advance our understanding of empathy (Neumann & Westbury, 2011). Therefore, further research is needed to investigate the most efficient methods of measuring empathy along different dimensions.

1.3 Dog ownership, experience with dogs and dogs’ behaviour

Do peoples’ experiences with dogs, allow them to learn to correctly recognize dogs’ actions? Eventually, the theoretical knowledge of canine behaviour does not determine people’s ability to correctly label the majority of the dogs’ behaviours (Tami & Gallagher, 2009). Additionally, classifying states of aggression, confidence and actual play, is proven to be most arguable and controversial (Tami & Gallagher, 2009). Although, humans’ ability to understand dog’s body language and expressions has received little attention in the literature on human–dog interactions (Tami & Gallagher, 2009). In particular, dogs’ behaviour is one of the major factors affecting the decisions of prospective dog-owners (Holland, 2019). However, later on, the dog-owner relationship is strongly more influenced by the owner characteristics, rather than the dog personality traits (Meyer & Forkman, 2014a). Dog-owners have general experience with dogs and seem to be able to identify what their pet want. Even so, committed dog owners fail to comply with some responsible ownership practices (Rohlf et al., 2010). On the other hand, dog-trainers have further experience and knowledge of canine behaviour, therefore their interactions with dogs are less problematic and more effective (Greenebaum, 2010). Dog-trainers are able to recognize the individual personalities of the dogs, and therefore to improve the quality of their relationships with the dogs (Savalois et al., 2013). In addition, dog experts are able to decode dogs’ signals and understand dogs’ simple emotional states (positive, negative, neutral), due to their further experience and knowledge of canine behaviour (Ouchi, 2017). However, research, using dog-owners report, outlined that dog-owners were able to categorize many major differences in communication in different dog breeds, without having any further knowledge and experience (Lit et al., 2010). Consequently, is experience a major factor, which affects how people interpret dogs’ actions?

1.4 Dogs’ behavioural problems

Most human-dog relationships are fulfilling and effective, but there are many which fail, resulting in large number of dogs being relinquished to animal shelters or abandoned each year (Marston & Bennett, 2003). Due to lack of actual understanding of dog behaviour, there are many behaviour-related problems in dogs. In addition, many of these problems are linked with owner attitudes (O'Farrell, 1997). Further, human and canine parameters can affect the development of canine behaviour problems (Powell et al., 2021). However, dogs’ behaviours may be perceived differently by their owners, and the type of perception may influence the owner's willingness to change those behaviours, even if it is irrelevant (Pirrone et al., 2015). The bad nutrition habits and poor diet have major impact on canine behaviour as well, and later on, on the dog-owner relationship (Bosch et al., 2007). Furthermore, the genetic inheritance and the developmental experience/environment affect the canine behaviour and temperament (Serpell, 1987). Genetic factors are responsible for nearly half of the variation in dogs’ social abilities (Bray et al., 2021). However, not all behaviours are heritable, including how easily a dog is provoked by a frightening trigger/ become aggressive (Morrill et al., 2022). In addition, there is an environmental factor, which affects the variation of OXTR gene (receptor of the hormone oxytocin) in pet dogs (Cimarelli et al., 2017). In particular, oxytocin is a hormone, which acts as neuromodulator of the emotional processing and social cognitive behaviour in nearly all mammalian species (Putnam & Chang, 2022). Therefore, the ability to correctly understand dogs’ actions is quite important for both dogs and owner’s overall welfare. In particular, improved dogs’ adoption was observed during COVID-19 pandemic, due to social isolation (Morgan et al., 2020). As dogs and humans are both social species, there are potential benefits of the dog-humans interactions corresponding to the One Welfare approach, which suggests connective links between animal welfare (including non-human animals) and human well-being and health (Morgan et al., 2020; Tarazona et al., 2019).

1.5 Relevant research on the human’s interpretation of dogs’ behaviour/emotions.

Understanding the mind of another species is a process of its own. It is very hard to understand the limits of the dog’s comprehension. Relevant study investigated the possible relationships between human sensitivity to nonverbal signals, experience with dogs and the quality of dog-human communication (Meyer & Forkman, 2014b). The results showed that experience does not increase peoples’ nonverbal sensitivity, and dogs showed insecure behaviour when interacting with people with lower nonverbal sensitivity (Meyer & Forkman, 2014b). Therefore, experience with dogs does not result in improved ability of non-linguistic communication; however, this ability is essential for the improvement of the quality of dog-human interactions (Meyer & Forkman, 2014b). For dogs' visual attention to social scenes in comparison to humans it was found that both were the same (Törnqvist et al., 2015). In particular, both dogs and humans stared for longer at pictures showing social interactions than in non-social images (Törnqvist et al., 2015). However, humans gazed longer at the actors in dog social interaction images rather than these of humans, whereas dogs gazed longer at the actors in human social interaction images rather than these of dogs (Törnqvist et al., 2015). Therefore, this might indicate that analysing social interactions between heterospecifics may be more challenging. Furthermore, during behavioural assessment of both dogs and humans, dogs tend to observe the body language, unlike humans who focuses more on the head and facial expressions of both species (Correia-Caeiro et al., 2021). Consequently, dogs do not interpret behaviour in an anthropomorphic way. However, domestic dogs are sensitive to human’s perspective (Call et al., 2003; Kaminski et al., 2009). In addition, there is evidence of 19 referential gestures performed by domestic dogs during their everyday communication with humans (Worsley & O’Hara, 2018). However, what remains unclear is how well people recognise these gesture expressions. Therefore, it is essential to investigate the possible factors that will improve people’s ability to correctly understand dogs’ behaviours and to be able to build an effective and close relationship with their dog.

1.6 The current study

Here I define empathy as “A complex capability enabling individuals to understand and feel the emotional states of others, resulting in compassionate behaviour.” (Riess, 2017). This study will assess the human’s empathetic experiences with pet dogs and their ability to correctly understand dog’s communicative behaviours. The hypothesis, tested in this dissertation, is that humans’ i) experiences with dogs and their ii) personal level of empathy affect their ability to correctly understand dogs’ communicative behaviours. The goal is to test the effect of these two factors and find if both, just one or neither of them affects people’s behavioural cognitive approach to dogs.

The study will be performed using two online multiple-choice questionnaires. The participants, which will complete these surveys, will be dog owners and people who do not own dogs and might have or not further experiences with dogs. The collected data is planned to show the i) personal empathetic level of each participant, ii) the approximate rate of dogs’ experience each participant set to itself and iii) their answers to situational questions. The first survey will include situational questions with presented pictures of a dog performing different behavioural gestures. In particular, these questions will be based on the study of Worsley and O’Hara, showing the cross-species referential signalling events in domestic dogs (Worsley & O’Hara, 2018). Further, it will include a question related to their level of experience with dogs on a scale from 1 to 5. The second survey will include an Empathy Quotient (EQ), which will test participants’ level of empathy (Baron-Cohen & Wheelwright, 2004; Sucksmith et al., 2013). This questionnaire contains empathy measurements, which are used by mental health professionals in assessing the level of social impairment in certain disorders. However, since levels of empathy vary significantly between all individuals, regardless the existence of any disorder, it is also suitable for use as a casual measure of temperamental empathy (Allison et al., 2011; Pehlivanidis et al., 2021).

**2 – Methods**

2.1 Participants

The participants chosen for this research were 52. The criteria used for their selection was their dog ownership. Twenty-five participants owned dog/s and twenty-five were people who do not own a dog. The age range of the participants was 15-80 years, with an average age of 25 years (M=25, SD=9.38). Both sexes participated in this research (37% males-63% females). All participants were asked to complete a consent form in advance. Participants were reached mostly on social media and contacted by direct messages or phone calls. The completion time given for both questionnaires was one week.

2.2 Materials

Participants were invited to complete two questionnaires. The first questionnaire, which was sent to the participants, was self-created, and included: i) 8 situational questions, which were used to measure the understanding of the participants related to the dogs’ needs and ii) a question, which was used to measure the approximate rate of dogs’ experience each participant set to itself. The situational questions were designed according to the research by Worsley and O’Hara, about the “Cross-species referential signalling events in domestic dogs” (Worsley & O’Hara, 2018). Each question was concluded by a picture of my own dog performing a specific position, and 4 possible answers, including “Pet me”, “I am hungry/thirsty”, “Open it” and “Get me that”. This way their knowledge of canine behaviours was tested, regardless of their experiences and level of empathy. An additional question regarding the personal experience with dogs of each participant was included at the end, and the answers were in a scale of 1 (no previous experience) to 5 (great experience). Furthermore, a table, including all tested dog gestures and their descriptions, was created, based on the same research (Table 1). The second questionnaire used for this survey was the Empathy Quotient (EQ), developed by Simon Baron-Cohen (Baron-Cohen & Wheelwright, 2004; Sucksmith et al., 2013). This questionnaire was used to measure the personal empathetic level of each participant and was concluded from 60 behaviour related questions. Both questionnaires can be found in the “Appendix” section.

Table 1.Ethogram of the gestures included in the statistical analyses.

|  |  |
| --- | --- |
| Gesture | Description |
| *Crawl under* | Move entire or part of body underneath an object or a human’s appendage. |
| *Paw* | Lifting of a single front paw to briefly touch an object or human. |
| *Flick toy* | Hold toy in the mouth and throw it forwards, usually in the direction of a human. |
| *Lick* | Licking an object or human once or repetitively. |
| *Paw rest* | Lifting a single front paw and resting it on an object or human. |
| *Back leg up* | Lifting of a single back leg whilst lay on one side of the body. |
| *Head rub* | Involves rubbing the head against an object or human on which the signaller is leaning on. |
| *Chomp* | Involves opening the mouth and placing it over the arm of a human whilst repeatedly and gently biting down on the arm. |

Source: (Worsley & O’Hara, 2018)

2.3 Procedure

Participants were told that the study was designed to explore the human’s empathetic experiences with dogs and their ability to correctly understand dogs’ communicative behaviours. The participants were asked to complete a consent form before taking part of the research, which were sent directly by message. The situational questionnaire was completed first and the empathy questionnaire was completed second. Both questionnaires were easily accessible in online form. The average completion time was 30 minutes for both questionnaires. All applicants were given written feedbacks on their answers and the opportunity to be kept updated on the research progress. At the end, participants were thanked in written form for their time and participation.

2.4. Statistical Analysis

The data were analysed using IBM SPSS Statistics (SPSS, Version 28.0). Multiple comparisons were essential, including: i) the dog behavioural questionnaire (DBQ) results versus the empathetic questionnaire (EQ) results, ii) the DBQ results versus the dog ownership results, iii) the DBQ results versus the personal experience with dogs’ results, and iv) the DBQ results versus all three selected factors. Test of Normality (Kolmogorov-Smirnov) was generated for each one of the data groups, to check if all data are normally distributed. For the first comparison, Spearman’s correlation was done, to check if there is significant relationship between the empathy and the DBQ results. As Spearman’s correlation test is non-parametric and does not assume normality, there are no limitations of its use. The data were shown using a scatter plot graph, performed in Microsoft Excel (Microsoft Excel, 2018). For the dog ownership and DBQ results comparison, Mann-Whitney U-test was generated to compare the means of both groups of data, due to abnormal distribution of the data. The results were presented in a boxplot graph, performed in Microsoft Excel (Microsoft Excel, 2018). For the final comparison-personal experience versus DBQ results- Spearman’s correlation was generated to investigate a potential significant correlation between the data. The data were presented using a scatter plot graph, performed in Microsoft Excel (Microsoft Excel, 2018). Finally, a comparison between all factors was needed. Therefore, a generalized linear model (GLM) was generated with goal to achieve a potential relationship/correlation between the response (DBQ score) and its predictors (empathy, dog ownership and personal experience with dogs). This analysis was done using the same software (SPSS) and the results were presented using a simplified table (SPSS, Version 28.0).

2.5. Ethical Approvement

This study was approved by the University of Salford with the approval ID 8796 and all the ASAB guidelines were adhered.

**3 – Results**

The final number of responses received was 52.

3.1 Dog-behavioural questionnaire results versus personal empathy level

The results for the Empathy-questionnaire data indicated normal distribution (Kolmogorov-Smirnov test, P= 0.2, df=52). However, the results for the Dog-behavioural questionnaire data showed abnormal distribution (Kolmogorov-Smirnov test, P< 0.001, df=52). Additionally, no statistically significant relationship between the behavioural questionnaire score and the empathy level was found (Spearman’s correlation, *rs* = 0.209, P= 0.138, df=52). The comparison of the two variables is presented on the graph below (Figure 1).

Chart, scatter chart

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Figure 1.Comparison between DBQ results and Personal Empathy level.

3.2 Dog-behavioural questionnaire results versus dog ownership

The results for both set of data indicated abnormal distribution (Kolmogorov-Smirnov test, P< 0.001, df=52). In addition, the two variables- dog ownership and behavioural quotient score- were found to be equal/have the same medians (Mann-Whitney U-Test=297, P= 0.437, df=52). The final comparison is presented on the graph below (Figure 2).

Chart, box and whisker chart

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Figure 2.The comparison between DBQ results and Dog ownership.

3.3. Dog-behavioural questionnaire results versus Personal experience with dogs.

The results for both variables indicated abnormal distribution of the data (Kolmogorov-Smirnov test, P< 0.001, df=52). Additionally, there was no statistically significant relationship between the two sets of data (Spearman’s correlation, P= 0.058, *rs*=0.265, df=52). The comparison between the two variables is presented on the graph below (Figure 3).

Chart, line chart, scatter chart

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Figure 3. The comparison between DBQ results and Personal experience with dogs.

3.4. Dog-behavioural questionnaire results versus all three factors

The results indicated no significant association/effect between the dog-behavioural quotient data and the three tested factors- empathy, dog ownership and experience with dogs (Generalized Linear Model, P=0.229, P=0.962, P=0.265).

3.5. Summary of key findings.

1. There is no significant relationship between the ability to correctly understand dogs’ behaviour and the personal level of empathy.
2. There is no significant relationship between the ability to correctly understand dogs’ behaviour and the dog ownership.
3. There is no significant relationship between the ability to correctly understand dogs’ behaviour and the personal experience with dogs.
4. There are no significant effects/interactions between the ability to correctly understand dogs’ behaviour and all three potential factors all together (empathy, dog ownership and personal experience with dogs).

**4 – Discussion**

The purpose of this research was to investigate the potential effects of empathy, dog ownership and personal experience with dogs on the people’s ability to correctly understand dogs’ behaviour. The reason of testing these three specific factors is because it was found that they have positive effects and improve human-dog mutual understanding in the field of behaviour and communication (Huber et al., 2017; Mariti et al., 2012; Tami & Gallagher, 2009). However, as can be concluded from the results, the personal level of empathy, the dog ownership criteria and the personal experience with dogs did not show any significant association with people’s potential to correctly identify dogs’ communicative behaviours.

4.1. Interpretation of results

These days dogs are part of many households around the world, and they are referred to as “human’s best friend”. Regardless the multiple researches that prove the health benefits associated with dog companionship, many dogs are relinquished, or euthanized, for purported behavioural problems (Stephens-Lewis et al., 2022). The importance of human perception and human capability to correctly understand behavioural terms and situations lead to the need of investigation of key factors supporting this critical knowledge. Therefore, to determine potential factors, two questionnaires were sent to people to test different hypothesis. However, half of the participants owned dog/s and half of them did not. The first psychological questionnaire tested the level of empathy of each participant. Further, the second questionnaire tested the personal experience with dogs each participant set to itself, along with their knowledge and ability to identify canine behaviour. Accordingly, it was hypothesized that higher empathy, further experience with dogs, and dog ownership increase people’s ability to correctly understand dogs’ communication. However, the results did not support any of these hypotheses.

Study has shown that the level of experience affects human perception of some emotional stages in dogs, such as fear and happiness (Wan et al., 2012). Furthermore, the number of dogs’ physical features that participants reported using for emotional interpretations increased with experience, and more-experienced respondents knew that dogs’ first sign of fear or happiness is observed in the ears (Wan et al., 2012). Apart from the incorrect identification of dog behaviour in adults, there are many incidents with young kids being bitten by dogs for the same reason. A current study has tested children, four to ten years-old, and revealed that experience plays an important role in their ability to correctly interpret dogs’ behaviour (Lakestani et al., 2014). However, the knowledge of canine behaviour is essential, and the experience only is not enough to ensure safe children-dog interactions (Lakestani et al., 2014).

Besides the essential experience with dogs, it is suggested that dog owners have better knowledge and ability to accurately identify canine behaviours. Investigation showed that dog owners appreciate to have good understanding of the emotional stage of their dog, although they seem to have no esteem of the signals that dogs send in the earlier stages of emotional arousal (Rehn & Keeling, 2016). Consequently, dog owners might have greater abilities to understand their dogs’ behaviour and emotions, but still the perspectives and experiences of pet owners and how they perceive and perform their responsibilities has not been studied in depth (Westgarth et al., 2019). Therefore, there is no reasonable evidence that dog ownership only, result in correct canine behaviour interpretation.

Human’s empathy, as factor which affects the human-dog communication, has not been investigated extensively. However, there is evidence that empathy affects both the speed and intensity of rating dogs’ emotional facial expressions (Kujala et al., 2017). Further, empathy, as a form of non-vocal communication, lead people to create anthropomorphic interpretations of dog behaviour, as this is the closest related to human-human interactions (Bahlig-Pieren & Turner, 1999). Even so, this way of definition is being rarely proven effective, and yet is more likely to occur as a coincidence. Additionally, a study revealed positive correlations between human empathy, pet preference, pet ownership and positive attitude (Daly & Morton, 2006). Consequently, there are connecting links between empathy and human-pet interactions, but further empirical investigation is needed to lead to clearer explanation of these relationships (Daly & Morton, 2006; Kielland et al., 2010).

Moreover, a research revealed that people with low levels of animal empathy and no previous experience with dogs assess dog behaviour and emotion related to aggressiveness as more pronounced than people with higher levels of animal empathy (Meyer et al., 2014). Consequently, the researchers have tested animal empathy, experience with dogs and dog ownership as factors which affect the human interpretation of dog behaviour (Meyer et al., 2014). Further, they did not find any significant relationships between these factors, however the results point to possible interactions between them, and additional research is being suggested (Meyer et al., 2014).

4.2. Limitations

4.2.1. Human’s empathy

The hypotheses were that people with higher level of empathy will score higher on the dog behavioural questionnaire, and also that dog-owners will show higher levels of empathy. However, no significant evidence for these was found. Empathy is the complex capability that improve human-pet connection and creates an ability of non-verbal communication and emotional comprehension (Vitulli, 2006). Although, dogs’ emotional states can be easier identified than dogs’ acts of communication. Facial expressions are of the first indicators of an emotional state of pain for most animals and humans (Bloom & Friedman, 2013). In addition, it is proven that facial expressions can be used to assess human-animal empathy related with the observation of individuals in pain (Ly & Weary, 2021). Furthermore, a study has shown that feeling empathy activates some of the pain-processing regions of the brain (Singer et al., 2004). Consequently, this research supports the reason why empathy is the best predictor of how people rate pain in dogs (Ellingsen et al., 2010). Other emotions such as fear, anger and happiness are proven to be easily identified using empathetic approach, along with positive attitude toward dogs, which is affected by the cultural/social milieu in which people grow up (Amici et al., 2019). In particular, current research has revealed that there are asymmetries in dogs’ facial expressions, which indicates states of fear and anger (Siniscalchi et al., 2022). Therefore, empathy only is ineffective factor for the improvement of the human’s understanding of canine behaviour in relation to the observation of emotional states.

4.2.2. Dog ownership

The hypotheses were that dog-owners will score higher on the dog behavioural questionnaire, and people without dogs, but with an intermediate level of experience with dogs will have high score as well. However, no significant evidence for these was found. Dog ownership satisfaction is more influenced by unwanted dog behaviour and high costs of ownership, than by perceived emotional closeness to the dog and shared activities (Herwijnen et al., 2018). In particular, unwanted dog behaviour is often associated with certain aspects of owner personality, attitudes and/or behaviour (Jagoe & Serpell, 1996). Furthermore, a study showed that the dogs’ emotional reactivity and the dog–owner relationship modulate each other, depending on the aspect of the relationship and dogs’ individual responsivity (Somppi et al., 2022). Consequently, dog-owners have strong influence on their dog behaviour, and they are responsible for their ownership satisfaction mostly. However, the correct interpretation of dog behaviour is not as simple as living with a dog, which results “instantly” in perfect knowledge of canine behaviour. Often, dog owners' perceived comprehension of dog behaviour is quite different than their actual comprehension (Kerswell et al., 2013). Indeed, that phenomenon is very often, and during the results communication of the current study with some of our participants, the same situation was observed. Additionally, a study outline that the training methods that dog-owners use are mainly punishment-based (Rooney & Cowan, 2011). However high levels of punishment may thus have adverse effects upon a dog's behaviour (Rooney & Cowan, 2011). Therefore, simple experience with dogs does not improve the comprehension of dog behaviour, however close emotional relationship owner-dog, along with further knowledge of canine behaviour will result in such improvement.

4.2.3. Experience with dogs

The hypothesis was that more experienced people will score higher on the dog behavioural questionnaire. However, no significant evidence for this was found. The famous psychologist John Dewey once said that “the interaction of knowledge and skills with experience is key to learning”. Indeed, learning to understand canine behaviour needs experience, and more important knowledge how to learn from each experience. In particular, there is a study showing that dogs learned how to understand some human communicative signs due to the experience they gained from their everyday life with their owner (Soproni et al., 2001). In addition, eye contact and name call are the major cues for how dogs understand that communication is intended for them (Kaminski et al., 2012). Dogs which are closer to people daily, have more experience in the development and use of communicative behaviours, than dogs which experience less human communication (Mendes et al., 2021). Consequently, people need experience as well, to be able to understand dogs’ communicative behaviour. In addition, research revealed that people with general dog experience, such as dog-owners, dog-trainers and veterinarians, are able to fairly understand dogs’ communication (Tami & Gallagher, 2009). However, the same study shows, that there are major differences in the responses, due to further knowledge of canine behaviour of some of the participants (Tami & Gallagher, 2009). Further, research indicated no significant interaction between experience and human’s ability to predict social behaviours in dogs (Donnier et al., 2020). Therefore, experience only does not affect people’s ability to correctly interpret dogs’ manners, however it can improve this ability a lot, if it is combined with broaden knowledge of canine behaviour.

4.2.4. Type of materials

The type of materials used to create the behavioural-situational assessment in this research was images, however this can only represent a specific moment of a certain behaviour and not the whole action. Observing a behaviour is a complex process and appropriate assessment materials are essential. Most of the researches related to interpretation of a behaviour are done using video materials for the presentation of the different behaviours or emotional stages, which are being examined (Bennett et al., 2017; Fleishman et al., 1998; Gácsi et al., 2016; O’Hara & Reeve, 2011; Trösch et al., 2020). An investigation of the effectiveness of different formats of media showed that video clips led to higher levels of both engagement and sympathy of the observers (Yadav et al., 2011). Additionally, the researchers argued that the main benefit of the video formats is that it results in an emotional engagement of the viewers with the observed subject (Yadav et al., 2011). Therefore, the use of video clips is the most effective research method in animal cognition to date. Finally, dogs use vocalizations as well in order to express their needs (Gaunet et al., 2022). Dogs’ barks carry significant amounts of information that humans can decode and use to improve their intraspecific communication (Péter et al., 2014). It is suggested that dog barking has emerged through selective processes, due to human communicative preferences where vocalization has been of greatest importance (Pongrácz et al., 2010). Additionally, findings suggest that dogs’ left hemisphere is specialized to process communicative vocalizations, and dogs’ right hemisphere is used to process intense emotions (Siniscalchi et al., 2008). Indeed, humans’ brain follows the same analysis pattern-right hemisphere is responsible for analysing peoples’ emotions, and left hemisphere is used to process communication and language (Johnsrude et al., 1997; Josse & Tzourio-Mazoyer, 2004; Schwartz et al., 1975). Therefore, dogs’ vocalizations need to be included in further research related to dog-human communication, along with the synergy of dogs’ communicative gestures and different potential factors.

**Conclusion**

In conclusion, this study demonstrated that there is a synergy of factors that affects the humans’ ability to understand canine behaviour. Indeed, many factors need to be investigated together, instead of a single one at a time, in order to examine efficiently behavioural relationships. In addition, research methods are crucial part of such investigations, and they must be chosen carefully, in order to maximise the research potential. Further, dogs’ vocalizations need to be investigated intensely, along with other communicative cues. However, the communicative importance of the different peoples’ abilities and capabilities in dog-human social interactions still remains poorly investigated. Future research could evaluate the factors, which affect the human interpretation of dog behaviour, in order to better identify methods of improvement of the communicative interactions between humans and dogs.

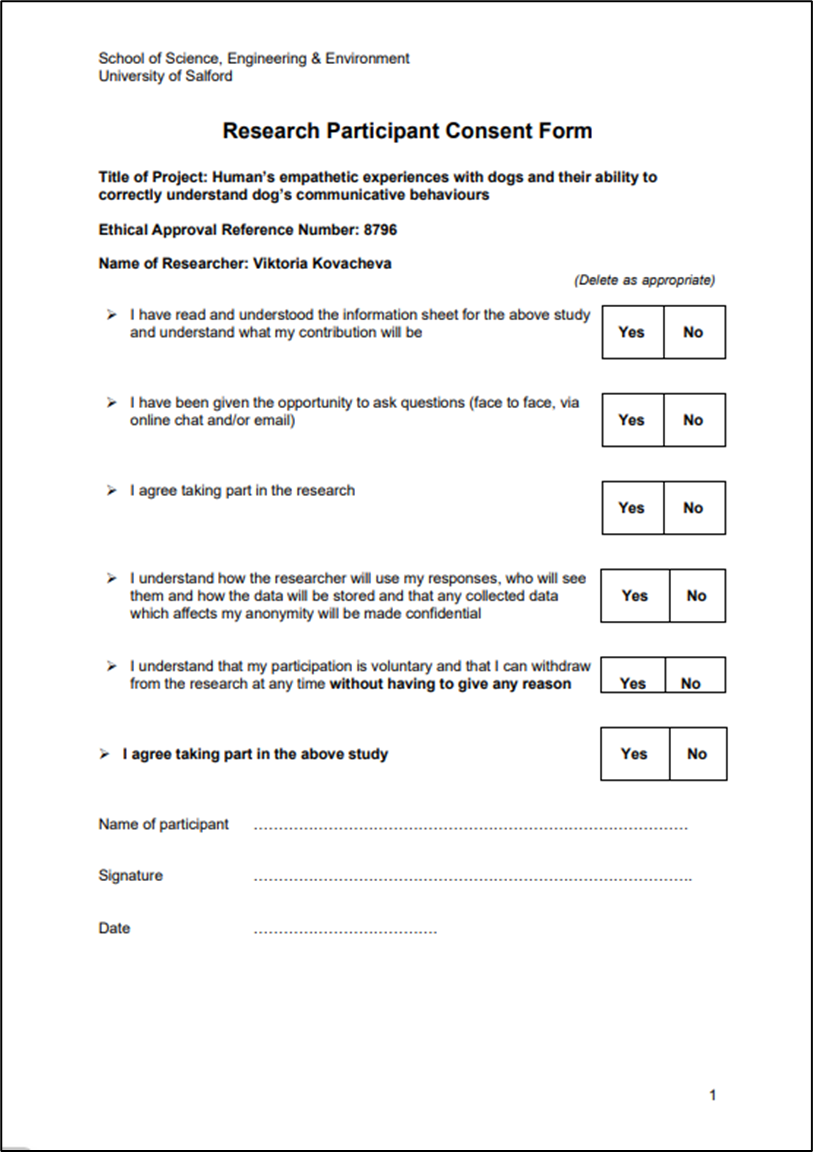
**Appendix**

Appendix.1 This is a [link](https://1drv.ms/w/s!AliSFpc78v5zjl-Zug_30TG9eGN3) to the research worklog.

Appendix 2. This is a [link](https://psychology-tools.com/test/empathy-quotient) to the Empathy Quotient (EQ) used in this study.

Appendix 3. This is a [link](https://docs.google.com/forms/d/e/1FAIpQLSfQjb9C0X4Ryz1BF72lgtRmO6gA-4VxeGmEK-GZIQGqCm2_Tg/viewform) to the situational/dog behaviour related questionnaire used in this study.

Appendix 4. The consent form sent to participants.



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