Recognition of emotion and pain by owners benefits the welfare of donkeys in a challenging working environment

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Working donkeys (*Equus asinus*) support human living standards globally. However, there is little information on the effect of human perceptions of emotion and pain on the welfare of working donkeys. We interviewed donkey owners (n = 332) in Pakistan to determine the relationship between human perspectives on donkey sentience: emotions and the ability to feel pain, and the routine working practices that could impact donkey welfare. The majority of donkey owners used padding under the saddle [n=211; 63.6%; 95% CI (58.3% - 68.9 %)] and provided access to food [n=213; 64.2%; 95% CI (58.9% - 69.3%)] and water (n=195; 58.7%; 95% CI (53.4% - 64.1%)] during the working day. Owners reported that at some point in their donkey's life, 65.3% (95% CI 60.2% - 70.5%) had load-associated injuries, of which 27.7% (n=92; 95% CI 22.8% - 32.5%) were wounds, 20.5% (n=68; 95% CI 16.1% - 24.8%) were lameness and 7.2% (n=24; 95% CI 4.4% - 10.0%) were back pain. In total, 81.3% (95% CI 77.1% - 85.5%; n=270) of owners believed that their donkeys felt pain, and 70.2% (95% CI 65.2% - 75.1%; n= 233) of owners believed that their donkeys had emotions. Multiple correspondence analysis (MCA) was used to understand the relationship between owners' recognition of emotions and pain in donkeys and their working practices. The MCA factor map revealed two clusters, named positive and negative clusters. The positive cluster included owner's recognition of donkey pain and emotions, the availability of food and water, use of padding under the saddle, absence of injuries along with the willingness to follow loading guidelines. The negative cluster represented practices that did not benefit donkey welfare, such as using saddles without padding and a lack of food and water during work. The presence of injuries, owners not

recognizing that donkeys feel pain and emotion along with an unwillingness to follow loading guidelines were also found in the negative cluster. We show that the owners who recognized sentience in their donkeys were more likely to use practices that are good for donkey welfare. The ability of owners to identify sentience in donkeys, along with their willingness to follow welfare guidelines, are important factors in improving the lives of working donkeys.

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Abstract

Working donkeys (*Equus asinus*) support human living standards globally. However, there is little information on the effect of human perceptions of emotion and pain on the welfare of working donkeys. We interviewed donkey owners (n = 332) in Pakistan to determine the relationship between human perspectives on donkey sentience: emotions and the ability to feel pain, and the routine working practices that could impact donkey welfare. The majority of donkey owners used padding under the saddle [n=211; 63.6%; 95% CI (58.3% - 68.9 %)] and provided access to food [n=213; 64.2%; 95% CI (58.9% - 69.3%)] and water (n=195; 58.7%; 95% CI (53.4% - 64.1%)] during the working day. Owners reported that at some point in their donkey's life, 65.3% (95% CI 60.2% - 70.5%) had load-associated injuries, of which 27.7% (n=92; 95% CI 22.8% - 32.5%) were wounds, 20.5% (n=68; 95% CI 16.1% - 24.8%) were lameness and 7.2% (n=24; 95% CI 4.4% - 10.0%) were back pain. In total, 81.3% (95% CI 77.1% - 85.5%; n=270) of owners believed that their donkeys felt pain, and 70.2% (95% CI 65.2% - 75.1%; n= 233) of owners believed that their donkeys had emotions. Multiple correspondence analysis (MCA) was used to understand the relationship between owners' recognition of emotions and pain in donkeys and their working practices. The MCA factor map revealed two clusters, named positive and negative clusters. The positive cluster included

40   owner's recognition of donkey pain and emotions, the availability of food and water, use of
41   padding under the saddle, absence of injuries along with the willingness to follow loading
42   guidelines. The negative cluster represented practices that did not benefit donkey welfare, such
43   as using saddles without padding and a lack of food and water during work. The presence of
44   injuries, owners not recognizing that donkeys feel pain and emotion along with an unwillingness
45   to follow loading guidelines were also found in the negative cluster. We show that the owners
46   who recognized sentience in their donkeys were more likely to use practices that are good for
47   donkey welfare. The ability of owners to identify sentience in donkeys, along with their
48   willingness to follow welfare guidelines, are important factors in improving the lives of working
49   donkeys.
50
51   **Introduction**
52   Working donkeys have played a crucial role in the development of human civilizations and
53   support some of the poorest communities in the world (Grace et al., 2022). There are
54   approximately 50.5 million donkeys globally (Norris et al., 2021) and they support
55   approximately 600 million people, including economically vulnerable communities in low and
56   middle-income countries (LMICs) (Sommerville, Brown & Upjohn, 2018). Poor people in
57   LMICs often depend on working donkeys for agriculture, construction, and the transportation of
58   goods (Figure 1) (Bukhari et al., 2022). However, until recently little research has been
59   conducted to assess and improve the welfare of working donkeys in LMICs. This could explain
60   why their importance has frequently been neglected in government-level animal welfare
61   regulations (Haddy et al., 2020). Hence, little is done to protect donkeys, resulting in
62   compromised welfare as an outcome of harsh working conditions, exclusion in the legal system,
63   and the disempowerment of both donkeys and donkey owning societies (Bukhari, McElligott &
64   Parkes, 2021).
65   The most serious problems affecting donkey welfare include overloading and general
66   overwork (Hameed, Tariq & Yasin, 2016; Bukhari, McElligott & Parkes, 2021). Increased load
67   weights affect the health and welfare of donkeys (Bukhari, McElligott & Parkes, 2021).
68   Moreover, unsuitable food and water, inappropriate saddling and harness, mishandling,
69   hazardous practices, lack of supporting infrastructure (veterinary care, welfare legislation and
70   regulatory bodies), and harsh environmental conditions are all factors that contribute to poor
71   working donkey welfare (Birhan et al., 2014; Genetu et al., 2017; Rayner et al., 2018; Kamran et
72   al., 2022), particularly for load-carrying donkeys.
73   Our perceptions of sentience (the ability to feel pain and to have positive and negative
74   emotions (Proctor, Carder & Cornish, 2013)) shape our intentions, motivations, and behavior,
75   which ultimately impact animal welfare (Luna et al., 2017; Luna & Tadich, 2019; Sinclair et al.,
76   2022). The ability to feel pain and have positive and negative emotions is one possible definition
77   of sentience that does not need the entity to be self-aware, but rather relies on their ability to
78   experience internal psychological states (Proctor, Carder & Cornish, 2013). How owners treat
79   their working animals is influenced by a complex combination of social convention, perceptions

80   of sentience, economic constraints, and, in some cases, a lack of access to appropriate advice.
81   Despite this complexity, one of the precursors to improving animal welfare is an
82   acknowledgement of animal sentience (Luna et al., 2018). Human recognition of sentience
83   improves overall animal welfare, health, and productivity (Budaev et al., 2020; de Waal &
84   Andrews, 2022).
85   Understanding human-animal interactions (HAIs) is a vital component of any strategy
86   aimed at improving the welfare of working animals (Spence, Osman & McElligott, 2017; Proops
87   et al., 2018; Luna & Tadich, 2019). Animal welfare can be compromised by negative HAIs,
88   which has adverse effects for the animal productivity, health, and wellbeing (Pinillos et al., 2016;
89   Rault et al., 2020). Domestic animals, in addition to relying on people for food, frequently seek
90   out positive social interactions with humans (Pinillos et al., 2016; Rault et al., 2020). Little is
91   known about HAIs for donkeys and how they may affect their welfare. (Shah et al., 2019;
92   Kamran et al., 2022). Increasing understanding of the human characteristics that influence
93   owner-donkey interaction and how this affects donkey welfare could aid in the appropriate
94   design of intervention strategies to improve the quality of owner-donkey relationships and the
95   welfare of working donkeys (Luna & Tadich, 2019).
96   It is difficult to determine what donkey owners do (i.e. working donkey care and handling
97   practices) and why they do it, unless welfare workers take the time to speak with them. However,
98   without this information any intervention will be based on incomplete and inaccurate knowledge
99   of working animal welfare (Upjohn, Pfeiffer & Verheyen, 2014). There is little information on
100   the relationship between human attitudes, empathy, recognition of emotions and pain, and
101   donkey welfare. The objective of the current study was to investigate the relationship between
102   human perspectives on donkey emotions and ability to feel pain along with willingness to follow
103   loading guidelines, and routine working practices that could impact donkey welfare.
104
105   **Materials & Methods**

106   **Study Area and Study Design**

107   The study areas and design have been described previously (Bukhari et al., 2022). Briefly,
108   we conducted a cross-sectional survey of donkey owners in four different regions (Swat, Attock,
109   Faisalabad, and Bahawalpur; Figure 2) of Pakistan. Regions were selected due to different
110   climatic and topographic conditions: mountainous, arid, irrigated plains, and sandy desert,
111   respectively (Table 1) (Khan, 2021). These four regions cover 39,815km^2 of the country
112   (approximately 4.5% of Pakistan).
113   *Questionnaire Design*
114   A questionnaire was designed to determine the relationship between human perspectives
115   on donkey sentience, and routine working practices that could impact donkey welfare (Luna et
116   al., 2017; Watson et al., 2020; Geiger et al., 2021). The questionnaire was developed based on
117   local knowledge of the donkey's routine work, with input from donkey owners and equine
118   veterinarians (Bukhari et al., 2022) . Due to low literacy rates, the questionnaire was conducted

119 with owners verbally (Fletcher & Wells, 2021; WHO, 2022), and took around ten minutes to
120 complete. All questions were close-ended, and the options were read to owners. In total, 332
121 donkey owners agreed to participate. In the first section of the questionnaire, the demographics
122 of the owners and signalment (age, sex, breed) of the working donkeys were determined.
123 Information on donkey loading practices was collected in the second part of the questionnaire.
124 Regarding loading practices, we asked about donkey injuries, causes of load associated injuries,
125 how owners assessed whether the load they are putting on their donkey is appropriate, whether
126 padding is used under the saddle, the pace at which the donkey worked, the seasonal impact on
127 workday duration, and the availability of feed or water during the working day. In the last
128 section, with regards to the owner's views on loading practices, we asked whether the current
129 weight carried by their donkeys was appropriate, why people might overload their donkeys,
130 whether they have noticed any changes to their donkey's condition since purchasing it, whether
131 they believed their donkey has emotions and whether they believed their donkey can feel pain.
132 Finally, we asked owners whether they would follow loading guidelines for the benefit of their
133 donkey, if such guidelines were available to them (Supplement 1 and 2).

134 **Data Collection**

135 Interviewers verbally explained the study, its methods, and its purpose. The convenience
136 sampling method was used, and owners were included based on their willingness to participate.
137 The owner's age was then determined verbally, and if they were over the age of 18, they were
138 invited to be interviewed. Before the interview began, their informed verbal consent was
139 obtained. After donkey owners agreed to participate, interviews were conducted using our
140 questionnaire. The Interviewers signed a "participant informed verbal consent form". A third
141 person signed the witness statement (witness, to ensure correct information exchange) on
142 "participant informed verbal consent form" according to existing survey guidelines (Fletcher &
143 Wells, 2021; WHO, 2022). Interviews were conducted in local languages (Urdu, Pashtu, Hindko,
144 Pothwari, Punjabi, and Saraiki) after being translated by interviewers who were equine
145 veterinarians fluent in both English and the respective regional local languages. This method was
146 used to ensure maximum response accuracy while minimizing any confusion about the scientific
147 terminology used in accordance with existing survey recommendations (Fletcher & Wells, 2021;
148 WHO, 2022).

149 **Variables**

150 Variables collected during the interview are presented in Table 2. For ease of presentation,
151 each variable has been assigned a short name and its structure (binary, categorical) is shown. For
152 question, "Do you think your donkey has emotions?", assigned short name is "Emotion". And
153 for question, "Do you think your donkey feels pain?", an assigned short name is "Pain".

154 **Statistical Analysis**

155   Categorical data were described as counts, percentages, and with 95% confidence intervals
156 (95% CI). A binary variable for the presence or absence of loads associated injuries (yes or no)
157 was created. We investigated the relationship between owners' recognition of emotion and pain
158 in their donkeys, willingness to follow guidelines, and current working practices using multiple
159 correspondence analysis (MCA) (Reid et al., 2017; Keogh et al., 2019). Variables spatially
160 clustered together, were considered similar to each other, with spatial distance indicating rare
161 associations (Greenacre, 2007; Alhuzali, Beh & Stojanovski, 2022). Where present, appropriate
162 names were generated to describe clusters. The MCA included region, area, injuries, saddle
163 padding, speed of donkey, availability of feed or water. Guidelines, emotion, and pain were also
164 included in MCA. Variable counts, percentages and 95% CI was computed using statistical
165 package for social science (SPSS) version 25.0, whereas, MCA was conducted using the open
166 source software RStudio-2022.07.1-554 (RStudio, 2022).

167 **Ethical Approval**

168   The research was approved by the Human Subjects Ethics Sub-Committee, City University
169 of Hong Kong (Approval reference no. JCC2021AY003).

170
171 # Results

172 **Loading Practices**

173   Owners reported that they assessed the practicality of the weight of the load for donkeys by
174 weighing the load [n=48; 14.5% (95% confidence interval (CI) 10.7% - 18.2%)], or by observing
175 their donkey's behavior [n=84; 25.3% (95% CI 20.6% - 30.1%)]. The majority of the donkey
176 owners used padding under the saddle [n=211; 63.6%; 95% CI (58.3% - 68.9%)]; and provided
177 access to food [n=213; 64.2%; 95% CI (58.9% - 69.3%)] or water (n=195; 58.7%; 95% CI
178 (53.4% - 64.1%)] during the working day (Table 3).

179 **Injuries associated with mounted loads**

180   Owners reported that 65.3% (95% CI 60.2% - 70.5%) of their donkeys had load-associated
181 injuries at some point of their life, of which 27.7% (n=92; 95% CI 22.8% - 32.5%) were wounds
182 and 20.5% (n=68; 95% CI 16.1% - 24.8%) were lameness. The majority of donkey owners
183 believed that overloading was the cause of load associated injuries [n=228; 68.7% (95% CI
184 63.6% - 73.7%)], while others believed that type of load (n=34; 10.2% (95% CI 6.9% - 13.5%)]
185 or practices during loading and unloading (n=70; 21.1% (95% CI 16.7% - 25.5%)] were the
186 cause of injuries (Table 4).

187   **Owners' views on loading practices**

188   Almost half of the owners [n=151; 45.5% (95% CI 40.1% - 50.8%)] believed that the
189   weight their animals carried was appropriate. In total, 81.3% (95% CI 77.1% - 85.5%; n=270) of
190   owners reported that they believed their donkeys felt pain and 70.2% of (95% CI 65.2% - 75.1%;
191   n= 233) owners believed that their donkeys had emotions. A total of 190 [57.2% (95% CI 51.9%
192   - 62.6%)] donkey owners said they would be willing to follow loading guidelines (if available)
193   for the benefit of their donkey (Table 5).

194   **Multiple correspondence analysis of working practices and recognition of emotion and pain**
195   **in donkeys**

196   The MCA factor map revealed two clusters of variable categories, named the Positive and
197   Negative cluster. Recognizing donkey pain or emotion, a willingness to follow loading
198   guidelines, availability of feed and water, absence of injuries, and use of saddle padding were
199   grouped in the 'Positive' cluster. In contrast, the 'Negative' cluster represented practices that did
200   not benefit donkey welfare, such as the use of saddles without padding and a lack of feed or
201   water during work. The presence of injuries, owners not recognizing that donkeys feel pain or
202   emotion along with unwillingness to follow loading guidelines were also found in the negative
203   cluster. Speed of the working donkeys did not fit into the clusters (Figure 3).

204

205   **Discussion**

206   We studied the relationship between human perspectives on donkey emotions and the
207   ability to feel pain, and the routine working practices that could impact donkey welfare. This is
208   the first report to elucidate owners' perceptions of donkey sentience and how it affects the lives
209   of working animals in Pakistan. Owners who recognized sentience in their donkeys were more
210   likely to apply good welfare practices, such as willingness to follow loading guidelines, using
211   padding under the saddle, and providing food and/or water during the working day (Positive
212   cluster, Figure 3). These owners also stated that their donkeys were uninjured during work.
213   Owners who did not recognize sentience in their donkeys were more likely to employ
214   practices that were detrimental to donkey welfare, such as using saddles without padding and a
215   lack of food and water during work (Negative cluster, Figure 3). Owners reported that at some
216   point in their donkey's life, most had load-associated injuries. Human empathy, emotions toward
217   animals, and perception of animal pain contribute to better HAIs and can enhance the welfare of
218   working equids (Lanas, Luna & Tadich, 2018; Proops et al., 2018; de Waal & Andrews, 2022).
219   Thus, we show that improved working donkey welfare occurs when the perception of sentience
220   is widely held by owners.
221   We showed owners' perceptions of emotions and pain are clustered with various positive
222   welfare practices (Positive cluster, Figure 3). Previously, when owners shared an affective
223   perception, a favorable welfare status (low occurrence of depressed working animals) was
224   observed (Luna et al., 2017). It has also been reported that when owners believe their animal has

225   feelings and needs, working animals have better welfare (for example, owners offer sufficient
226   food and water to donkeys). (Luna & Tadich, 2019). Empathy for animals fosters positive
227   attitudes toward animals and heightens ability to acknowledge animal pain (Lanas, Luna &
228   Tadich, 2018; Proops et al., 2018; de Waal & Andrews, 2022), which ultimately benefits welfare
229   of working donkeys. Every interaction and experience an animal receives throughout its life
230   leads to a negative or positive response, impacting the welfare of that animal (Wolfensohn,
231   2020). Little research has been conducted to identify the human characteristics that modulate the
232   owner-donkey interaction and how these may affect the welfare of working animals (Shah et al.,
233   2019; Kamran et al., 2022).

234   In our survey, nearly two thirds of owners reported their donkey experiencing load
235   associated injuries (wounds, lameness, and back pain). This is similar to a study conducted in
236   India on donkeys, where 62.8% of the population had injuries, with wounds comprising most
237   injuries (Rayner et al., 2018). Similarly, wounds were highly prevalent (72.1%) among the
238   working equines in Ethiopia (Biffa & Woldemeskel, 2006). In comparison to this, the prevalence
239   of wounds in the Merawi-Ethiopia (38.3%) was quite low (Tsega et al., 2016), and in
240   Baluchistan-Pakistan the prevalence of wounds and lameness was 9.2% and 16.3%, respectively
241   (Kamran et al., 2022). However, it is not clear whether these donkeys were doing load associated
242   work in those regions. Moreover, a recent study of working donkeys pulling carts in Faisalabad-
243   Pakistan discovered that 96% of donkeys were lame (which is a very high number) when
244   examined by a veterinarian, despite the fact that the donkey was still in harness (i.e. donkeys
245   were examined while the harnessing system was attached) (Khan et al., 2022). The lack of
246   injuries was clustered with recognition of emotion and pain (Positive cluster, Figure 3) in our
247   report. In Baluchistan-Pakistan, 86.2% of donkey owners do not whip their donkeys to avoid
248   injury and report that animals feel pain in the same way that humans do (Kamran et al., 2022).
249   This pertains to the fact that when owners believe their donkey feels pain, their animals have a
250   low prevalence of injuries.

251   Most donkey owners in this study used padding on their load carrying donkeys. The use
252   of saddles with padding was clustered with the recognition of emotion and pain (Positive cluster,
253   Figure 3). Previous studies have identified that appropriate saddle padding was an important
254   positive welfare practice for working donkeys (Birhan et al., 2014). In Ethiopia, the prevalence
255   of back sores was associated with saddle condition, and donkeys used with inappropriate saddle
256   were twice as likely to have back sore than those used with the proper saddle (Birhan et al.,
257   2014). Wounds caused by inappropriate saddle were higher in both working horses (62.7%) and
258   donkeys (50.6%) in Ethiopia. This could be due to the pressure, friction, and shear lesions caused
259   by saddles without adequate padding. Furthermore, in Ethiopia, 76% of horses and 89.7% of
260   donkeys were used for continued work despite the presence of wounds. (Genetu et al., 2017).
261   Working animals with inappropriate saddles had higher prevalence (63.3%) of wounds in
262   Southern Ethiopia (Tesfaye, Deressa & Teshome, 2016), Eastern Ethiopia (40.9%), Morocco
263   (54%) and up to 45% wounds are related to the saddle in the Egyptian brick kilns (Farhat,

264 McLean & Mahmoud, 2020). A possible explanation for these observations is a lack of
265 understanding of sentience, basic husbandry practices, and donkey needs.
266   Overall, 64.2% and 58.7% of owners reported feeding and watering their donkeys during
267 the working day, respectively. In Ethiopia, 72.5% donkey owners practice feeding twice per day,
268 and they provide feed before loading (Tesfaye, Deressa & Teshome, 2016) and in Chile, most
269 working animals (83%) were fed three times per day (Luna et al., 2017). In Ethiopia, food
270 shortage is the major constraint to productivity and work performance of donkeys (Birhan et al.,
271 2014; Tsega et al., 2016). They are forced to work without proper feed, reflecting their poor
272 welfare status. (Birhan et al., 2014; Tsega et al., 2016). Moreover, in Ethiopia, 85% donkey
273 owners provide water three times per day, regardless whether or not donkey was working
274 (Tesfaye, Deressa & Teshome, 2016). However, there are reports of animals carrying a pack or
275 pulling a cart for 8 hours without water (Pritchard et al., 2005). Long working hours without
276 proper watering not only cause depression in donkeys, but can also result in death in severe cases
277 (Hameed, Tariq & Yasin, 2016). In contrast, in Chile, the majority of working animals (90%)
278 had access to drinking water throughout the day as owners believe that their animal has feelings
279 and needs (Luna et al., 2017).
280   Body condition is an important measure of donkey welfare (Haddy et al., 2021). Most of
281 the owners (66.6%) reported no change in perceived body condition, and 18.6% of owners
282 reported that the body condition of their donkey had decreased since they bought it. In previous
283 reports, 41.6% of Ethiopian (Moltumo et al., 2020), and 56% Egyptian working donkeys had a
284 poor body condition (Farhat, McLean & Mahmoud, 2020). However, it is essential to note that in
285 Ethiopia and Egypt, body condition was measured by trained professionals, in contrast to our
286 study, in which perceived changes were reported by owners rather than direct evaluations of
287 body condition. Donkeys have been documented to have a poorer BCS than mules and horses in
288 LMICs (Burn, Dennison & Whay, 2010). This could be due to a number of factors such as poor
289 management, high work load, shortage of essential nutrients, scarcity of feed, and lack of
290 supplementary diets (Herago et al., 2015; Bukhari, McElligott & Parkes, 2021). Poor body
291 condition and overwork are the main contributors to the occurrence of wound in working
292 donkeys (Tesfaye, Deressa & Teshome, 2016). In Mexico, donkeys with poor body condition
293 were more likely to acquire wounds due to load associated work (Tesfaye, Deressa & Teshome,
294 2016; Haddy et al., 2021). This may be because these low BCS donkeys have less natural
295 padding to protect themselves from injuries associated with mounted load carrying. Almost half
296 of our study population was associated with rural agricultural business. These donkeys are not
297 subject to a heavy workload (Bukhari et al., 2022) in comparison with donkeys working at brick
298 kilns, so the reported positive changes in BCS may be linked to workload.
299   Owner acquisition of empathic abilities towards their animals and the establishment of
300 positive HAIs can have important consequences both for the performance and welfare of
301 working equids (Luna & Tadich, 2019). For example, owners with a greater perception of
302 sentience in equines kept animals in a better welfare state and may explain why there was high
303 frequency of horses in Chile that responded positively to both the observer and the owner (Luna

304 et al., 2017; Kamran et al., 2022). In addition, owners' perceptions of pain towards equines were
305 found to be highly associated with their empathic skills (Luna et al., 2018). Therefore, strategies
306 intended to improve the welfare of working equids should not only consider the identification of
307 their main welfare problems, but should also include the assessment of the main factors that
308 modulate HAIs from the human perspective, such as the owner's empathy towards animals
309 (Tadich et al., 2016; Proops et al., 2018; de Waal & Andrews, 2022). The motivational bases that
310 underpin attitudes toward animals must be identified in order to develop strategies to improve
311 donkey welfare. It is important to understand that working equids face different challenges in
312 different communities and geographic sites (Haddy et al., 2020).
313   Our research represents a snapshot of some working practices and their association with
314 owner's thinking of donkey sentience in three regions of Pakistan. Future surveys should
315 investigate welfare parameters such as proper housing, access to veterinary care after work-
316 related injuries, and other husbandry practices in relation to owner perception of sentience.
317 Studying perception of working donkey emotions and pain is important (Lanas, Luna & Tadich,
318 2018) because knowledge about how working donkey owners perceive emotions and pain in
319 their animal, and how recognition of sentience may influence the welfare of these animals, is
320 scarce. Interviewer translated the questionnaire in the local language verbally during the donkey
321 owner's interviews, this may lead to the loss of meaning or alteration in different languages with
322 different interviewers/translators (Filep, 2009). Moreover, as we do not yet know how much a
323 donkey should safely carry and what the loading limits/guidelines for donkeys should be. This
324 may affect the owners answer for "would you follow loading guidelines?" However, their
325 answers to the question do show their intent to follow scientific guidelines for improved welfare
326 for their animal. In addition, we should also investigate donkey behavior in working setup and
327 their association with owner's attitude towards donkey sentience and their welfare. More
328 targeted interventions to improve welfare will be possible with a better understanding of the
329 working donkey-owner relationship.
330

Conclusions

331
332   Empathy, attitude towards animals, and pain perception are some of the human
333 psychological traits that influence human-animal relationships and animal welfare. The ability of
334 owners to identify sentience in donkeys is an important factor for improving welfare and may
335 influence how working animals are treated. We show that the owners who recognized sentience
336 were more likely to use practices that are good for donkey welfare (positive cluster) in a
337 challenging working environment. Explaining donkey sentience to owners (not following good
338 working practices [negative cluster]) and the benefits of improving their donkeys' welfare
339 through proper working practices will help motivate positive change.
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Figure 1

Two examples of loading practices in Pakistan (a) Donkeys carrying bricks (b) A donkey owner loading their animal with Lucerne at a farm. Photos: Syed Saad Ul Hassan Bukhari.

Figure 2

Map of Pakistan showing the locations of the four study regions (sourced from GISArc).
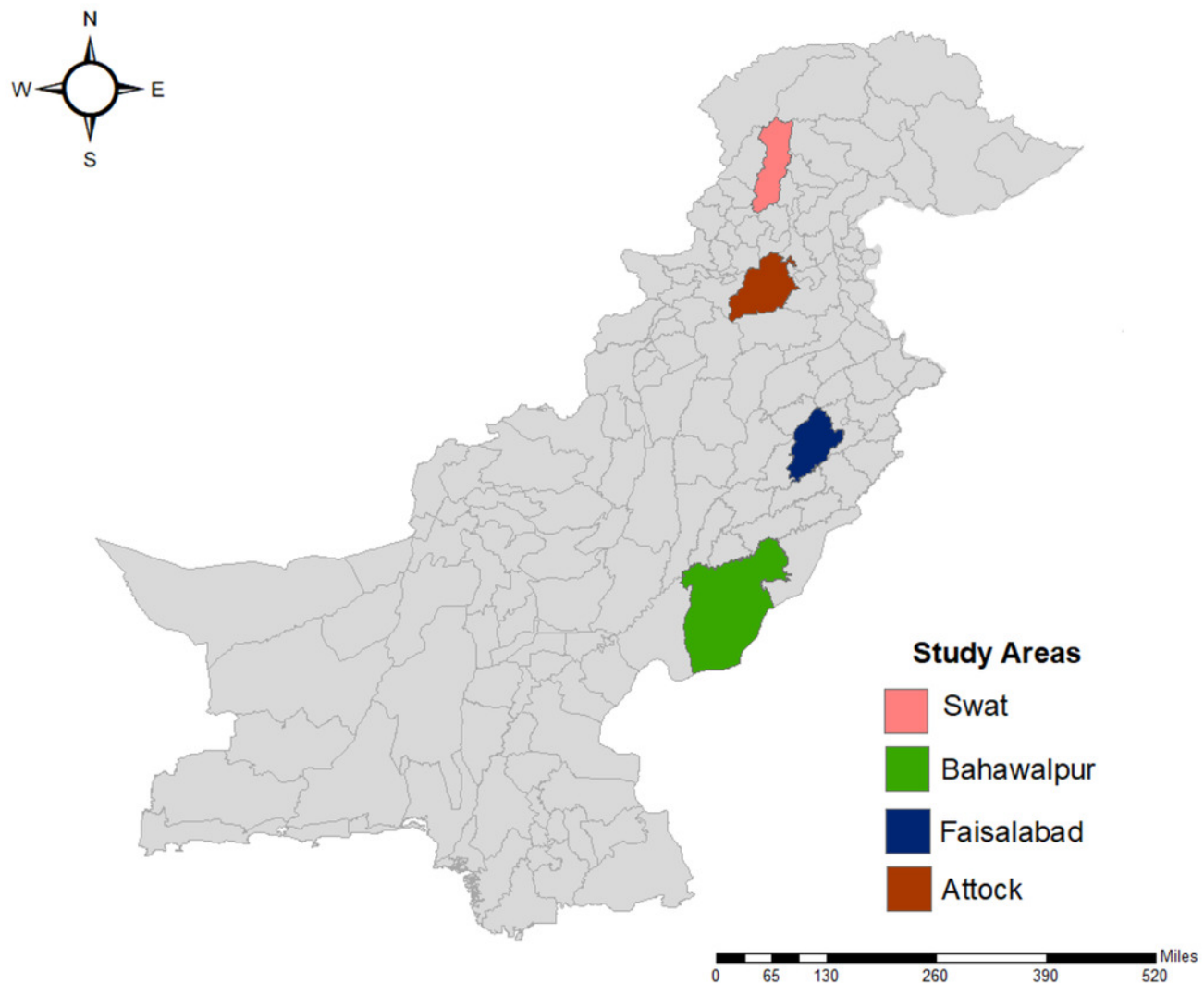
Figure 3

Multiple correspondence analysis (MCA) factor map with respect to categorical variables.

Variance explained by dimension one and dimension two was 45.89% and 22.09%, respectively. Color dots represent categorical variables, and signs (+, -, ±, S, A, F, B, R, PU, U) represent their categories.
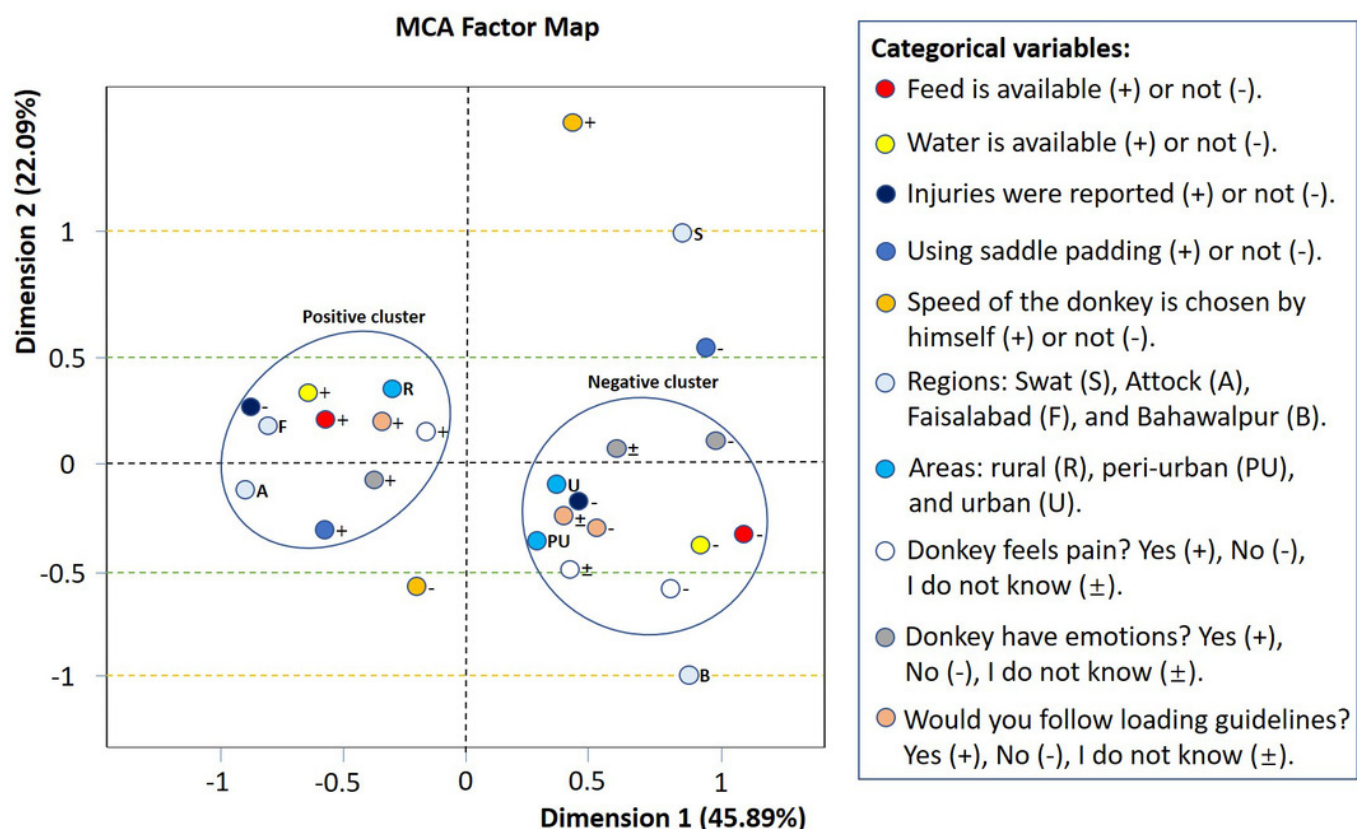
Table 1(on next page)

Elevation, coordinates and environmental conditions of the study areas in Pakistan (Khan, 2021).

1

Region	Elevation above sea level (m)	Coordinates		Highest average monthly temperature	Lowest average monthly temperature	Annual rainfall (mm)
		Longitude	Latitude			
Swat	2591	72°54'	34°45'	37 °C in July	0 °C in January	1200-1400
Attock	519	72°51'	32°55'	38 °C in June	3 °C in January	900-1000
Faisalabad	185	73°08'	31°26'	41 °C in June	5 °C in January	300-400
Bahawalpur	88	70°41'	28°39'	42 °C in June	4 °C January	100-150

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Table 2(on next page)

Variables collected during the interview.

1

Variable collected	Assigned short name	Variable structure
How you assess that the load you are putting on your donkey is practical for them?	Load assessment	Categorical
Do you use padding under the saddle?	Saddle padding	Binary - yes or no
How is the speed of loaded donkey selected?	Speed of donkey	Binary - chosen by donkey or triggered by you
Does the duration of work per day vary by season?	Duration of work	Binary - yes or no
Is there availability of feed during the working day?	Availability of food	Binary - yes or no
Is there availability of water during the working day?	Availability of water	Binary - yes or no
Have you seen load associated injuries in your donkey?	Injuries	Categorical
What is the cause of load associated injuries?	Cause of injuries	Categorical
The weight that you put on your animal, is it good for your donkey?	Appropriateness of current mounted weight	Categorical
What is the reason that people overload their donkeys?	Reason for overloading	Binary - for more income or to finish work earlier
Have you noticed an increase or decrease in general body condition since you bought this donkey?	Body condition	Categorical
Do you think your donkey has emotions?	Emotion	Categorical
Do you think your donkey feels pain?	Pain	Categorical
Would you follow loading guidelines (if available) for benefit of your donkey?	Guidelines	Categorical

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Table 3(on next page)

Practices of working donkey owners (n=332) related to mounted load carrying for
working donkeys in Pakistan.

1

Variables	Categories	Number	Percentage (%)	95% confidence interval (CI) lower - 95% CI upper (%)
Load assessment	By weighing load	48	14.5	10.7 - 18.2
	Checking donkey behavior	84	25.3	20.6 – 30.1
	Adding load approximately	178	53.6	48.2 – 58.9
	I don't know	22	6.6	3.9 – 9.3
Saddle padding	Yes	211	63.6	58.3 – 68.9
	No	121	36.4	31.2 – 42.7
Speed of donkey	Chosen by donkey	90	27.1	22.3 – 31.9
	Triggered by the owner	242	72.9	68.1 – 77.7
Duration of work	Yes	201	60.5	55.2 – 65.8
	No	131	39.5	34.1 – 44.7
Availability of food	Yes	213	64.2	58.9 – 69.3
	No	119	35.8	30.6 – 41.0
Availability of water	Yes	195	58.7	53.4 – 64.1
	No	137	41.3	35.9 – 46.6

2

Table 4(on next page)

Load associated injuries and their possible causes reported by owners (n=332) for working donkeys in Pakistan.

1

Variables	Categories	Number	Percentage	95% confidence interval (CI) lower - 95% CI upper (%)
Injuries	Wounds	92	27.7	22.8 – 32.5
	Lameness	68	20.5	16.1 - 24.8
	Back Pain	24	7.2	4.4 - 10.0
	Wounds and lameness	21	6.3	3.6 - 8.9
	Wounds and back Pain	5	1.5	0.0 - 3.6
	Wounds, lameness, and back Pain	7	2.1	0.2 – 3.7
	No injuries observed	115	34.7	29.5 – 39.8
Cause of injuries	Type of load	34	10.2	6.9 – 13.5
	Overload	228	68.7	63.6 - 73.7
	Practices of loading and unloading	70	21.1	16.7 - 25.5

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Table 5(on next page)

Owners' (n=332) views on loading practices related to mounted load carrying by working donkeys in Pakistan.

1

Variables	Categories	Number	Percentage	95% confidence interval (CI) lower - 95% CI upper (%)
Appropriateness of current mounted weight	Yes	151	45.5	40.1 - 50.8
	No	69	20.8	16.4 – 25.2
	I don't know	112	33.7	28.6 – 38.8
Reason for overloading	For more income	183	55.1	49.7 - 60.5
	To finish work earlier	147	44.3	38.9 – 49.6
	Both for more income and to finish work earlier	2	0.6	0.0 - 1.4
Body condition	No change in body condition	221	66.6	61.5 - 71.7
	Body condition increased	49	14.8	10.9 - 18.6
	Body condition decreased	62	18.6	14.4 - 22.9
Emotion	Yes	233	70.2	65.2 - 75.1
	No	62	18.7	14.4 - 22.9
	I don't know	37	11.1	7.7 - 14.5
Pain	Yes	270	81.3	77.1 - 85.5
	No	45	13.6	9.8 - 17.2
	I don't know	17	5.1	2.7 – 7.5
Guidelines	Yes	190	57.2	51.9 – 62.6
	No	8	2.4	0.7 - 4.1
	I don't know	134	40.4	35.1 - 45.7

2