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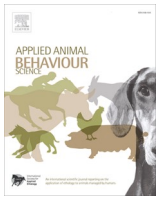

Is the Familiar Human Approach Test a valid method for evaluating the quality of human-goat relationship in pasture-based systems?

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ABSTRACT

A study was carried out to validate the Familiar Human Approach Test (FHAT) for the evaluation of the human-animal relationship (HAR) in goats at pasture. The FHAT originally proposed for sheep (AWIN Welfare Assessment Protocol) was modified to be adapted to goats. The validation of this modified version of FHAT was carried out by checking its convergent validity with the Latency to the First Contact Test (Latency; expressed in seconds), which was already developed, validated, and included in the AWIN Welfare Assessment Protocol for Goats to evaluate HAR for dairy goats kept indoors. Eighteen dairy goat farms were included in this study. The FHAT was performed during the grazing season at pasture by familiar assessors (i.e., farmers), while external assessors evaluated the reaction of goats to the routine gathering of animals by the farmer. The Latency was performed both by unfamiliar and familiar assessors during autumn-winter indoor housing. Farms were classified into four classes, based on goats' reactions to farmers at pasture: 1. Avoidance (withdrawal of the whole flock from the farmer, n= 4); 2. Approach (at least one goat allows the farmer to approach and/or follows the farmer; no physical interaction, n= 7); 3. Contact (at least one goat voluntarily approaches the farmer; contact lasts ≤3 seconds, n= 3); and 4. Acceptance (at least one goat accepts to be touched by the farmer; contact lasts >3 seconds, n= 4). Latency time was compared among the four classes. Latency was higher in the classes without contact (Avoidance and Approach) when compared to the classes with contact (Contact and Acceptance) between humans and goats. However, the differences among the classes were significant in response to the presence of the familiar assessor only [familiar assessor (P=0.016): Avoidance: 164.3 ± 114.83 s, Approach: 115.6 ± 127.04 s, Contact: 48.0 ± 40.95 s, Acceptance: 7.8 ± 5.44 s; unfamiliar assessor (P=0.631): Avoidance: 161.5 ± 159.96 s, Approach: 144.6 ± 122.35 s, Contact: 77.3 ± 39.88 s, Acceptance: 61.0 ± 67.38 s]. The four classes were then merged depending on the absence (Avoidance+Approach) or presence (Contact+Acceptance) of physical interaction between goats and farmers. Again, Latency time was significantly (133.3 ± 119.34 s *vs* 25.0 ± 32.20 s; P=0.006) and not significantly (150.7 ± 129.34 s *vs* 68.0 ± 53.63 s; P=0.328) different when performed by the familiar and unfamiliar assessors, respectively. The strong correlation between Latency to the familiar and unfamiliar assessors suggests that goats generalize their response to humans based on HAR quality. Results support the use of FHAT for the evaluation of HAR in goats raised in pasture-based systems.

1. Introduction

A positive human-animal relationship (HAR) is paramount for guaranteeing high levels of welfare and it is a measure of good management and appropriate handling of animals, including goats (Celozzi et al., 2022; Waiblinger et al., 2006). This relationship should be built from the birth of animals and reinforced along their life (Miller et al., 2018; Rault et al., 2020). Positive and frequent contacts, gentle handling, avoiding both shouts and the use of sharp objects to move the animals are some examples of behaviours that farmers can have towards their animals and that probably lead to the establishment of a good HAR (Lürzel et al., 2015; Waiblinger et al., 2006). Attitude and behaviour of people that work with animals influence the reactions of animals towards humans. Farm animals can either generalize and discriminate their perception towards humans, meaning that they can feel at ease with all the people except one specific person (e.g., veterinarian,

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nervous milker) or *vice versa* (Waiblinger et al., 2006). Farm animals are usually less reactive to humans if they have frequent and regular contacts with them. This is the case of dairy animals that are milked once or twice a day (Battini et al., 2016). This is also more evident in intensive farming conditions, where animals receive frequent daily visits by different workers (e.g., cleaner, milker, farmer and stockperson in general) (Can et al., 2016).

Currently, the most recent welfare assessment protocols for farmed ruminants include tests that provide a measure of HAR quality when the animals are kept under intensive farming systems and rarely under pasture-based systems, such as the avoidance distance to an approaching human (e.g., cattle) or the behavioural reaction of animals towards the presence of an unfamiliar person in the pen (e.g., goats) or to the presence of a familiar person who tries to gather the animals (e.g., sheep) (AWIN, 2015a, 2015b; Welfare Quality®, 2009). In the case of dairy goats, the Animal Welfare Indicators (AWIN) project validated the Latency to the First Contact Test (Latency) that measures the time elapsed between the entrance of an unfamiliar assessor in a pen and the first physical contact with the assessor performed by at least one goat (AWIN, 2015b; Battini et al., 2016, 2015). However, the presence of a pen is required to perform the Latency, whose feasibility is therefore limited to intensive husbandry systems. Nevertheless, goat production systems around the world are mainly classified as extensive, with often use of marginal areas (Escareño et al., 2012; Silva et al., 2022). The HAR of goats kept at pasture cannot be evaluated using the Latency test, because there are no pens in the grazing area and, even in the presence of fences, the area would be too large for the animals to have any interest to approach the assessor. In addition, farm animals at pasture are known to increase the distance towards humans as they are less used to a close relationship (Battini et al., 2011) and therefore this test could be less effective and feasible in pasture-based systems.

The AWIN project also developed a protocol for sheep which can be applied both in intensive and extensive farming conditions and which includes a test (Familiar Human Approach Test; FHAT) to evaluate HAR quality. This test evaluates the reaction of sheep when the farmer tries to gather them at pasture as part of the daily routine (AWIN, 2015a). Some attempts have been performed to use the FHAT in goats at pasture and the assessors reported a good feasibility and inter-observer reliability of the test (Battini et al., 2021; Leite et al., 2020), suggesting that it could potentially be applied to goats reared in pasture-based systems. However, no information is currently available about FHAT validity in goats. Therefore, validation studies are required before including FHAT in protocols for the assessment of goats' welfare.

Aim of this study is to test the convergent validity [defined as significant correlation between an indicator and other measures to which it is related, i.e., gold standard (Battini et al., 2014; Frick et al., 2005)] of a modified version of the FHAT originally developed for sheep, with the Latency test already validated in intensively reared goats, in view of its potential use for the evaluation of HAR quality in goats reared in pasture-based systems (e.g., summer grazing period). The Latency test was used as gold standard and compared with the same test performed by a familiar person, hypothesising that the responses to familiar and unfamiliar persons are correlated. We then hypothesised that there is a relationship between the response to the Latency test performed by familiar and unfamiliar persons and the results obtained through the application of FHAT at pasture, and therefore all tests are reliable measures of the HAR quality.

2. Material and methods

The experimental protocol was designed according to the guidelines of the current European Directive on the protection of animals used for scientific purposes (2010/63/EU). The trial was approved by the Bioethics Committee of the University of Turin (Italy) (protocol n° 0587791).

2.1. Farms characteristics

The study was conducted in 18 dairy goat farms located in Piedmont (North-Western Italy). The HAR assessment was performed during two subsequent periods: July-August 2022 (summer grazing period) and November-December 2022 (autumn-winter indoor housing period). In both periods, the same farmers took care of the goats in each farm.

On average, the farms housed 37.5 ± 21.90 (min 4, max 74) lactating goats, which were of 44.0 ± 13.87 months of age. Goat breeds were the following: Alpine (59 %), Alpine × Valdostana (18 %), Saanen (9 %), Grey Goat of Lanzo Valleys [9 %; Cornale et al., 2014)(and Valdostana (5 %) breeds.

During autumn-winter period, the goats were housed indoor, and all (except in one farm) had also occasional access to outdoor areas. The goats were fed conserved forages (hay) and concentrate was offered during milking; the animals had free access to sodium chloride lick blocks and to clean and fresh water. From May-June to October-November, the goats had access to pasture areas (93.0 ± 131.90 ha; range: 3–300 ha) during the whole day and were night-sheltered in closed barns; fresh grass from pasture was the main feed source and, depending on farm feeding management, the goats were also supplemented with flaked cereals, beet pulp, bran and/or sodium chloride. In the summer months, free access to clean and fresh water was always available inside the barn, whereas water availability at pasture depended on presence/absence of natural (e.g., streams) or artificial (e.g., water troughs) resources.

In all the farms, the lactating goats were milked twice a day, with a prevalence of manual (61 %) over mechanic (39 %) milking.

2.2. Familiar and unfamiliar assessors

In this study, the farmers who acted as familiar assessors were predominantly males (77.78 %), aging 44.4 ± 14.81 years (min 19, max 72). Sixty-seven per cent of them had a husbandry tradition for several generations. The predominant education level of the farmers was that of secondary school (72.22 %), followed by agriculture technical school (16.67 %); two farmers followed bachelor's or master's degree courses in agricultural or veterinary sciences but only one of them concluded the academic studies. The daily workload of the farmers was equal to 8.9 ± 4.91 h. The majority (89 %) of the farmers enlisted the help of shepherd dogs, that were mainly used to gather the goats at pasture. Familiar assessors performed the FHAT at pasture during the summer grazing period, and the Latency during the autumn-winter indoor housing period.

The unfamiliar assessors performed the Latency during the autumn-winter housing period and acted as external assessors when the farmers performed the FHAT at pasture. The unfamiliar assessors were two students of the MSc in Animal Science at the University of Turin (Italy). They had no previous specific experience with goats and received a common training before the beginning of the study based on e-learning material developed by two authors of the AWIN Welfare Assessment Protocol for Goats (AWIN, 2015b). After the training, a perfect agreement (100 % of correct classification of the reactions of goats during the FHAT) between the assessors was achieved. The unfamiliar assessors recorded the data separately in two different geographical areas: one assessed the HAR in 10 farms and the other assessed the HAR in eight farms.

2.3. Data collection

After some preliminary observations conducted at pasture on goat flocks not included in the current trial, the FHAT originally proposed to evaluate the HAR for sheep and included in the AWIN Welfare Assessment Protocol for Sheep (AWIN, 2015a), was conveniently modified to be adapted to the caprine species. The original FHAT for sheep, which measures the response of the animals to the usual approaching method

adopted by the farmer (on foot, on quad bike, in vehicle, etc.), includes three levels of reactions towards humans: flight, approach without contact, and voluntary contact with the familiar human (Table 1). Interestingly, the preliminary observation we conducted at pasture allowed us verifying that the goats also walked directly towards the farmer and/or followed the farmer, but if the farmer tried to touch them, they did not accept the contact. This fourth reaction, not contemplated for the ovine species, was therefore included in the modified version of FHAT here proposed for goats (Table 1). In our opinion, the proposed four reactions (namely Avoidance, Approach, Contact and Acceptance) better reflect goats' reactions towards farmer's approach, being also in agreement with the classes suggested by Mattiello et al. (2010) in an Avoidance Distance test used to evaluate HAR in goats reared under intensive farming systems.

In the current study, the FHAT was applied by the familiar assessor (i.e., farmer) at pasture during the summer grazing season. With the aim of testing goats that were already accustomed to the new environment and farm routine, and therefore collecting reliable results, the farms were visited at least two months (82.3 ± 23.86 days) after the beginning of the summer grazing season. Farmers were asked to approach their goats as usual (e.g., on foot, on quad bike, in vehicle, with the help of shepherd dogs, etc.) while gathering the animals before the evening milking. The external assessors were as far away as possible to observe the goat reactions without disturbing the animals. The reactions of the whole goat flock towards the farmer's approach were recorded according to the four classes reported in Table 1. In case of Avoidance reaction, the external assessors also estimated by eye the avoidance distance (expressed in meters), as detailed in Table 1. However, this information was not elaborated, because of the very limited sample size (i.e., only four farms in the Avoidance class reaction).

Table 1
Comparison between the original FHAT included in the AWIN Welfare Assessment Protocol for Sheep (AWIN, 2015a) and the modified version of FHAT proposed for goats.

FHAT from AWIN sheep		Modified FHAT for goats	
Class of reaction	*Definition*	*Class of reaction*	*Definition*
Flight observed	Sheep withdraw in response to human approach. If sheep show a flight reaction, the minimum approach distance to the group is recorded.	Avoidance	Goats withdraw from the farmer when they approach. The avoidance reaction may be a retreat or flight of the whole flock. In the presence of an avoidance reaction, the assessor records the closest distance (expressed in meters) the animals allow the farmer to approach, before moving away.
Sheep approached	Sheep remain motionless at human approach.	Approach	At least one goat allows the farmer to approach and/or follows the farmer, but no physical interaction occurs.
Sheep voluntarily contacted human	Sheep walk directly towards farmers and interact with them by sniffing, nosing.	Contact	At least one goat voluntarily approaches the farmer within the first two minutes of his/her arrival or in response to his/her call, seeking contact (sniffing, touching). The contact lasts ≤3 s.
		Acceptance	The farmer can touch (>3 s) at least one goat within the first two minutes after gathering the animals.

The Latency was performed at least two weeks (46.8 ± 30.08 days) after the goats were back to the winter barn at the end of the summer grazing period and before the kidding season (which occurred in the period from January to March). The test was performed in the morning, at least one hour after feed administration. The Latency developed by the AWIN project and included in the AWIN Welfare Assessment Protocol for Goats (AWIN, 2015b) involves unfamiliar assessors, only. However, as in the current study the FHAT was applied by familiar assessors (i.e., farmers), to check the convergent validity of FHAT with Latency, we decided to involve familiar assessors also in the indoor HAR evaluation. First, the Latency was applied by the unfamiliar assessor, and, in the meantime, the farmer was asked to be out of sight of the goats, with the aim to avoid any influence of their presence on the obtained results. After 5 min from the end of the test performed by the unfamiliar assessor, the farmer was asked to perform the Latency as well, applying the same identical procedure applied by the unfamiliar assessor. The only difference was that the unfamiliar assessors started the Latency approaching the gate of the pen and waited for 30 s before entering inside the pen, while the familiar assessors did not wait before entering inside the pen because goats were already accustomed to their presence. A detailed description of the Latency is reported in the AWIN Welfare Assessment Protocol for Goats (AWIN, 2015b). Briefly, the assessor walked to a place inside the pen which was midway along the longest side of the pen (by the wall) or, if that was not possible, by the feeding rack. Once arrived at this pre-determined starting place, the assessor stood motionless with the back to the wall and started the stopwatch. During the test, the assessors were asked (i) not to stare directly at any of the goats present inside the pen, and to look at the ground or around the pen; (ii) to keep their arms and hands alongside the body or behind the back; and (iii) to hold the eventual binder or tablet still, against their chest. Only female goats were present inside the pen when the Latency was performed; males, when present, were taken out of the pen during the execution of the test. The stopwatch was stopped when the first goat nuzzled or touched any part of the assessor's body; if no contact occurred between goats and human, the test was stopped after 300 s.

2.4. Statistical analysis

The experimental unit used for the data analysis is the farm (n = 18). The Kolmogorov–Smirnov test was used to check Latency data obtained by familiar and unfamiliar assessors for normality. Since the assumption of normality was violated, non-parametric statistical tests were applied. Spearman's correlations were calculated between Latency performed by familiar and unfamiliar assessors. Farms were classified into four classes (i.e., Avoidance, Approach, Contact and Acceptance), according to the results obtained applying the FHAT at pasture. Within each class, the differences between the results of the Latency conducted by familiar and unfamiliar assessors were compared by means of Wilcoxon signed-rank test. A Kruskal-Wallis test, followed by Bonferroni-adjusted pairwise comparisons, was performed to compare the Latency results obtained by familiar and unfamiliar assessors among the FHAT reaction classes. After checking the results, the four classes were merged two by two depending on the absence (merging Avoidance and Approach) or presence (merging Contact and Acceptance) of physical interactions showed by the goats towards the farmer during the FHAT, and differences between these two newly formed classes were tested using the Mann-Whitney U test. Significance was declared at $P < 0.05$.

3. Results

The Latency results performed by familiar and unfamiliar assessors resulted correlated ($\rho = 0.497$; $P = 0.036$). No significant differences were found between Latency to familiar and unfamiliar assessors within each FHAT class.

The results of the Latency, performed by the unfamiliar and familiar assessors, for each FHAT reaction class are presented in Table 2. The Latency performed by the unfamiliar assessor showed no significant differences depending on the reactions of the goats during the FHAT ($P = 0.631$). On the contrary, Latency results obtained when the test was performed by the familiar assessor showed differences depending on the reactions of the goats during the FHAT ($P = 0.016$). In particular, the Latency recorded when the familiar assessor performed the Latency differed significantly between Acceptance and Avoidance ($P = 0.015$) and tended to differ significantly between Acceptance and Approach ($P = 0.054$).

The results of the Latency classified according to the absence or presence of physical interaction between goats and humans during the FHAT performed at pasture by the familiar assessors are presented in Table 3. Also in this case, the Latency performed by the unfamiliar assessor showed no significant difference depending on the absence or presence of physical interaction ($P = 0.328$), while the difference was significant when the Latency was performed by the familiar assessor ($P = 0.006$).

4. Discussion

The quality of HAR strongly affects the welfare of animals (Mota-Rojas et al., 2020; Napolitano et al., 2020; Rault et al., 2020). Welfare assessment protocols commonly include indicators to evaluate HAR that require specific measures. However, measures that are valid for one species may not be valid for other species (EFSA, 2012). Moreover, different husbandry systems require context-specific tests that take into account context-related feasibility constraints (Temple and Manteca, 2020). Many tests exist to assess HAR in goats (Celozzi et al., 2022; Minnig et al., 2021), but to our knowledge none is available for pasture-based systems. In this study, we used the FHAT from the AWIN Welfare Assessment Protocol for Sheep (AWIN, 2015a), as it is feasible for large groups of animals at pasture, and we checked its convergent validity against the Latency to First Contact Test, validated for goats reared in intensive and semi-intensive farming systems (AWIN, 2015b). Although the Latency included in the AWIN Welfare Assessment Protocol for Goats was validated only with unfamiliar assessors, Latency to the familiar (farmer) and unfamiliar assessors showed a strong correlation, suggesting that goats generalize their response to humans based on HAR quality and that the test might be valid in both cases. Furthermore, our analysis showed no differences between the Latency performed by familiar and unfamiliar assessors in each class of reactions. This further supports the validity of Latency performed by both familiar and unfamiliar assessors to assess HAR in goats. However, as expected, the Latency to the familiar assessor was consistently lower than that to the unfamiliar assessor, probably as a consequence of the higher confidence level established with the farmer during daily contacts. This suggests that, if a familiar person performs the test, the Latency threshold for considering a good HAR quality might be lower than the one reported in the AWIN Goat app for goats in response to the presence of an unfamiliar person (i.e., 24 s).

Most flocks we assessed at pasture with the FHAT were classified in the Approach reaction class, confirming our preliminary observations and the suitability of including this reaction class for goats. The other three reactions (Acceptance, Contact and Avoidance) were evenly distributed among the visited flocks.

The Latency results were consistently higher in the classes without physical interaction (Avoidance and Approach) when compared to the classes involving physical interaction (Contact and Acceptance) between goats and humans. As lower Latency values correspond to a better HAR (Battini et al., 2016), the obtained results indicate better HAR in the latter classes. This supports the validity of the FHAT to evaluate HAR in goats reared in pasture-based systems. However, differences among the four classes were significantly different only when the Latency was performed by the familiar assessor. When the FHAT reaction was classified as Acceptance, the obtained Latency values were particularly low when conducted by the farmer indoors (7.8 ± 5.44 s; min 2, max 15 s). The trend was similar with the unfamiliar assessor, but the differences among the four classes were less pronounced (although they approached statistical significance). In fact, Latency to the familiar assessor is particularly low in the two FHAT classes involving physical interaction, whereas Latency in the two classes which did not involve physical contact is high both in response to the familiar and to the unfamiliar assessor (Table 2). This might be explained by the fact that, when the HAR quality is poor, goats tend to generalize a negative perception of humans, and thus avoid to get in touch with humans, irrespectively of whether they are familiar or unfamiliar (Waiblinger et al., 2006); however, when the HAR is good, they might be able to better discriminate between familiar and unfamiliar persons, actively looking for physical contact with a familiar person with whom they had positive experiences.

Due to the study's limitation related to the small number of farms, we explored whether pooling the four FHAT reaction classes into two classes (presence or absence of physical interaction) would yield stronger results. Even considering only these two broader classes, significant differences were observed only when the Latency was performed by the familiar assessor. Although merging classes did not improve the statistical significance, the obtained results suggest that using two classes (physical interaction / no physical interactions) can provide a good estimate of HAR quality, noticeably improving the feasibility of the HAR evaluation at pasture. Thus, registering whether goats accept or not to get in touch with the farmer seems to be a quick and practical method for assessing HAR quality in goats in pasture-based systems.

As reported in previous works (Battini et al., 2021; Leite et al., 2020), the HAR feasibility is not a major issue, and it was easily achieved in all the visited farms also in the current study. However, feasibility constraints may arise due to specific management practices in Alpine regions. Even if this was not the case in the 18 farms visited in the present study, during the summer grazing period farmers sometimes merge and

Table 2
Results of the Latency to the First Contact Test (Latency, expressed as seconds (s) elapsed before a goat has a first contact with the assessor) performed by an unfamiliar and a familiar assessor are reported according to the reaction classes showed by goats when the FHAT was applied at pasture by a familiar assessor.

FHAT	N farms	Latency to unfamiliar	Latency to familiar
		Mean ± SD (min-max), s	
Avoidance	4	161.5 ± 159.96 (19–300)	164.3 ± 114.83 (53–300)[a]
Approach	7	144.6 ± 122.35 (26–300)	115.6 ± 127.04 (19–300)[a,b]
Contact	3	77.3 ± 39.88 (32–107)	48.0 ± 40.95 (20–95)[a,b,c]
Acceptance	4	61.0 ± 67.38 (6–145)	7.8 ± 5.44 (2–15)[c]

a,b,c: means within a column with different superscript letters differ significantly ($P < 0.05$).

Table 3
Results of the Latency to the First Contact Test (Latency, expressed as seconds (s) elapsed before a goat has the first contact with the assessor) performed by an unfamiliar and a familiar assessor are reported according to the absence or presence of physical interaction between goats when FHAT was applied at pasture by a familiar assessor.

FHAT	N farms	Latency to unfamiliar	Latency to familiar
		Mean ± SD (min-max), s	
Absence of physical interaction	11	150.7 ± 129.34 (19–300)	133.3 ± 119.34 (19–300)[a]
Presence of physical interaction	7	68.0 ± 53.63 (6–145)	25.0 ± 32.20 (2–95)[b]

a,b: means within a column with different superscript letters differ significantly ($P < 0.05$).

mix different flocks under a single stockperson, shared by owners to reduce costs and workload (Battaglini, 2007). In these cases, both the feasibility and the validity of group-level welfare assessment might be compromised. The feasibility of individual identification for goats belonging to each farm is often time-consuming and impractical. It is difficult to distinguish goats from different flocks, except in cases where there are different breeds or hair coat colours; however, this is an exception rather than the norm. Additionally, the validity of this test may be compromised because many species, such as sheep, cats, and monkeys, learn what to fear by observing their peers (Gariépy et al., 2014). This means that group dynamics strongly influence the behaviour of goats, and their reactions at pasture may not accurately reflect the overall quality of HAR during winter for all animals. To overcome these difficulties, we suggest performing the FHAT after a habituation period, during which the farmer should become familiar to all animals. In our study, we performed the test at least 60 days after the start of the grazing period, therefore we suppose that goats had already established a relationship with the farmer.

5. Conclusion

According to the obtained results, we suggest including the FHAT adapted to goats to assess HAR in pasture-based systems, as this test proved to provide a reliable estimate of HAR quality. These conclusions stem from the fact that we found a strong correlation between the results obtained by familiar and unfamiliar assessors when the Latency to the First Contact Test (gold standard) was applied indoors, and that the Latency test showed statistically significant differences in goats' reactions when it was conducted by a familiar assessor. Furthermore, the test is feasible, easy, quick, and safe to be applied at pasture. No specific training is required for this test to be applied, both for farmers and for external assessors registering the reactions of goats to farmers. A simplified version of the FHAT, just registering the presence or absence of physical interaction between goats and farmers, further enhances the overall feasibility of the HAR assessment at pasture. In the future, it might also be interesting to investigate the possibility of performing the FHAT with an unfamiliar, instead than with a familiar person, to overcome the problems due to the merging of different flocks under a single stockperson in Alpine regions during the summer grazing season.

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CRediT authorship contribution statement

Monica Battini: Conceptualization, Methodology, Validation, Formal Analysis, Writing – original draft, Writing – review & editing, Visualization, Project administration; **Manuela Renna**: Conceptualization, Writing – original draft, Writing – review & editing, Visualization, Project administration; **Benedetta Torsiello**: Investigation, Writing – review & editing; **Luca Battaglini**: Investigation, Funding acquisition, Writing – review & editing; **Silvana Mattiello**: Conceptualization, Validation, Writing – original draft, Writing – review & editing, Project administration, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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