



Influences on the avoidance and approach behaviour of dairy goats towards an unfamiliar human—An on-farm study



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ABSTRACT

The human-animal relationship (HAR) is an important factor for successful animal husbandry and animal welfare. Thus, the HAR is included in on-farm assessments to evaluate overall welfare. For dairy goats, validated tests to assess the HAR are lacking. The aim of the present study was to evaluate several tests of the HAR for on-farm assessment regarding validity and feasibility. We visited 43 dairy farms in Austria and Germany and conducted one test with a stationary human (approach test in the pen—APP) and three tests with a moving human (avoidance test at the feed barrier—AvF, avoidance distance test at the feeding place—ADF, avoidance test in the pen—AvP). In addition, milker behaviour towards goats was observed, stockpeople's attitudes towards interacting with goats were assessed via questionnaire and information was recorded about other potential influencing factors such as management, herd and housing characteristics. Convergent validity was investigated by (1) inter-test associations using a principal components analysis (PCA) and (2) by analysing associations of tests with potential influencing factors by use of multiple linear regression. Feasibility is described in terms of practicability of the tests in different farm designs and of time requirements. Variation between farms was high in all four tests. PCA revealed three factors including (1) all but one variable of the tests with a moving human, (2) all and only variables of the approach test, and (3) variables of AvF, AvP and APP where animals accepted touch or approached (nearly) to touch. Regression analyses revealed that the percentage of negative milker interactions (NegProportion) was the predominant influencing factor, being a predictor in seven of nine models: The higher NegProportion, the more avoidance and the less approach behaviour towards the unfamiliar test person were observed in all four tests ($P \leq 0.001$ in 4 models, $P \leq 0.01$ in one, $P \leq 0.05$ in one and $P = 0.16$ in one model with a beta of $|0.3|$ to $|0.8|$). Measures of AvF and AvP were explained best by human behaviour and were hardly influenced by confounding factors with an explained variance up to 80%. While feasibility of AvP was high, AvF and ADF could not be performed on about 30% of the farms due to unsuitable feeding equipment. However, AvF can be modified to improve feasibility. Avoidance tests at the feeding place and in the pen can validly assess the human-animal relationship on dairy goat farms as shown by the strength of inter-test associations and of the association with human-animal contact variables. A combination of avoidance tests at the feeding barrier and in the pen is recommended.

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1. Introduction

The human-animal relationship (HAR) can be defined as the degree of relatedness or distance between the animal and the human, i.e. their mutual perception (Waiblinger et al., 2006). This perception is based on previous interactions, alters the expectation of the other's behaviour, and is reflected in the mutual behaviour (Estep and Hetts, 1992; Waiblinger et al., 2006). Depending on the

relative strength and valence of the emotions involved, the HAR can range from negative, where animals perceive the human as frightening, to positive, where the human is perceived as a source of pleasure (Hediger, 1965; Waiblinger et al., 2006). A negative HAR is undesirable as it can seriously impair farm animal welfare, productivity and product quality (e.g. Ivemeyer et al., 2011; Lensink et al., 2000b; Probst et al., 2012; for review: Hemsworth and Coleman, 2011; Rushen et al., 1999). Moreover, fearful animals are more difficult to handle, increasing the risk of injury, and decreasing job satisfaction of farm workers (Hemsworth and Coleman, 2011).

Due to its importance for animal welfare, the HAR is included in protocols for on-farm welfare assessment, e.g. the Welfare Quality®

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protocols for cattle, pigs and poultry (Blokhuis et al., 2013; Welfare Quality®, 2009a,b,c). Furthermore, investigation of the HAR is essential to improve the welfare of farmed animals and their stockpeople (Waiblinger et al., 2006). For these purposes, valid, reliable and feasible tests are required, as were already developed for e.g. dairy cows (Waiblinger et al., 2002b; Windschnurer et al., 2009) and laying hens (Graml et al., 2008; Raubek et al., 2007). A test or measure is valid if it really reflects what it is supposed to, and validity comprises different aspects (Martin and Bateson, 1993). On-farm studies allow for testing convergent validity (1) by testing for associations of different tests that presumably assess the animals' perception of and thus their relationship with humans and/or (2) by testing for associations of test results with stockpeople behaviour (Waiblinger et al., 2006). Tests evaluated in on-farm studies generally have a high external validity because they have been tested on many farms encompassing a high variety of HARs and of potential influencing factors; thus, they are of high practical relevance (Lehner, 1996; Waiblinger et al., 2006). Feasibility describes the extent to which a measurement is possible, practicable and worthwhile (Martin and Bateson, 1993). In other words, feasibility of a test is determined by time, personnel and equipment needed and by the possibility to conduct this test on different farms.

The stockperson's behaviour is the most important factor determining farm animals' relationship to humans (for review: Hemsworth and Coleman, 2011; Waiblinger et al., 2006). Sequential relationships between the farmers' attitudes, farmers' behaviour and animal behaviour, productivity and welfare were confirmed for different farm animal species (e.g. Hemsworth et al., 1994; Lensink et al., 2000a; Waiblinger et al., 2002b). However, there are only few on-farm studies investigating the HAR in goats, and little information regarding tests for assessing the HAR on farms is published. Waiblinger et al. (2008) evaluated a test with a stationary human (approach test) as well as two tests with a moving person (avoidance distance, AD) in the barn and at the feeding place and reported moderate to high test-retest reliability on 10 farms (i.e. repeatability of results when the animals were tested one day later with the same experimenter; comprises aspects of intra-observer reliability). Mattiello et al. (2010) evaluated an AD test in the barn on 15 dairy goat farms with regard to its feasibility. The test seemed feasible and differentiated between farms with different herd sizes: the goats' AD was higher in large farms (55 to 194 goats) compared with small farms (9 to 46 goats). Muri et al. (2013) tested different measures of the HAR as part of a welfare assessment protocol. They assessed farmers' attitudes towards goats and towards handling them, scored the behaviour of the stockperson during the handling of goats and goats' responses in a handling test as well as the reaction of restrained goats to an unfamiliar person that tried to touch their chin (chin contact test). The farmers' belief about the importance of petting was linked to the goats' behaviour in the chin contact test, providing some evidence for the validity of this test. So far, no study investigated the link between actual stockperson behaviour during routine handling situations and goat reactions towards humans in standardised tests. Attitudes are known to be antecedents of human behaviour (Ajzen and Fishbein, 1980; for dairy farmers: Hemsworth et al., 2000; Waiblinger et al., 2002b) and their assessment by questionnaires can add to the observation of stockpeople's handling behaviour as observation of all stockpeople working with the goats is difficult on a farm with several stockpeople.

Besides the actual relationship of the animals with humans, other factors may influence the animals' reactions and thus limit the validity of tests for assessing the HAR. Potential confounding factors might be the age of the animals (Sambraus, 1974), the social environment (Waiblinger et al., 2003) or spatial constraints in the barn. The relative importance of such confounding factors differs

between tests, depending on the exact situation such as location or test type (stationary or moving human; Waiblinger et al., 2003; Waiblinger et al., 2006).

The objective of the present study was to evaluate several tests for on-farm assessment of the HAR regarding convergent validity and feasibility. We visited 43 dairy goat farms and performed tests with a stationary person (approach test) as well as tests with a moving person (avoidance and avoidance distance tests). We evaluated convergent validity by examining (1) inter-test associations using a principal components analysis (PCA) and (2) the associations between test results and potential influencing factors (human interactions with goats during milking, stockpeople's attitudes towards handling of goats as an approximation for further daily handling behaviour, herd and housing variables). To evaluate the feasibility of the tests, the proportion of farms where the test could be conducted and the time necessary were taken into account.

2. Methods

2.1. Farms and animals

This study was conducted on 43 dairy goat farms in Austria and Germany between March 2008 and November 2009. Collection of data on the human-animal relationship was part of a larger study on social stress and injuries in large dairy goat herds with horned or hornless animals. Each farm was visited for two successive days and data collection for all aspects of the whole study followed the same schedule on all farms.

The number of lactating goats per farm was 155 ± 97 (mean \pm S.D, range: 78–518), including diverse dairy goat breeds (i.e. mainly Saanen, German Improved White, German Improved Fawn and their crosses). On about half of the farms the lactating goats were kept in one group, on the rest in several groups, with an average group size of all farms of 98 ± 72 (20–340). The groups consisted of female goats only with the exception of two farms, where male goats were continuously living in the lactating goat groups, and of 10 farms where one or more kids were reared with their mothers in the lactating group. The average annual milk yield per goat was 689 ± 159 kg (380–1070 kg), the average daily milk yield per goat at the time of the visit was 2.36 ± 0.64 l (1.2–4.14 l). Fifteen farms (35%) had completely hornless herds (i.e. animals were either polled or disbudded), the rest had herds mixed of horned and hornless (polled or disbudded) goats. The goats were all kept in loose housing on deep litter, partly with a heightened concrete feeding place and partly with an outdoor run.

2.2. Tests assessing reactions towards humans

Four tests were conducted on the second day of the farm visit and the order of the tests was always the same: Two tests assessing the goats' avoidance behaviour and their avoidance distance at the feeding rack were followed by an approach test and an avoidance test in the barn. The two tests at the feeding rack were conducted during regular feeding times or, if this was not possible, food was provided additionally at another time to allow testing of feeding goats. In case the first two tests could not be conducted at all (see below), the tests were simulated by the test person before commencing the two tests in the pen to ensure similar pre-test experience for the subsequent tests. About half of the farms ($N = 19$) kept their goats as one group in a large pen. In case the goats were kept in more than one group, i.e. living in separate pens (2 groups on 11 farms; 3 groups on 7 farms; 4 groups on 4 farms; 5 groups on 2 farms), up to three groups per farm were tested depending on the conditions (e.g. suitability of pens) and the time table. The

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