Applied Animal Behaviour Science 142 (2012) 11–17

Contents lists available at SciVerse ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Relationship between growth rate and oral manipulation, social nosing, and aggression in finishing pigs

Irene Camerlink[a,b,*], Piter Bijma[b], Bas Kemp[a], J. Elizabeth Bolhuis[a]

[a] Adaptation Physiology Group, Department of Animal Sciences, Wageningen University, P.O. Box 338, 6700 AH, Wageningen, The Netherlands
[b] Animal Breeding and Genomics Centre, Department of Animal Sciences, Wageningen University, P.O. Box 338, 6700 AH, Wageningen, The Netherlands

ARTICLE INFO

Article history:
Accepted 18 September 2012
Available online 12 October 2012

Keywords:
Indirect genetic effects
Swine
Tail biting
Affiliative behaviour
Average daily gain

ABSTRACT

Pigs may affect each other's health, welfare and productivity through their behaviour. The effect of a pig on the growth rate of its pen mates is partly heritable and is referred to as its social genetic effect. Social genetic effects, also known as indirect genetic effects, have been found in a number of livestock breeds, in natural and laboratory populations, and in plant breeding and forestry, and have become an important research topic in recent years. In pigs, social genetic effects are hypothesized to be related to behaviour. The mechanism behind social genetic effects for growth, as well as the relationship between behaviours and growth itself, is largely unknown. To gain insight in the mechanism behind social genetic effects, we investigated the relationship between behaviours and growth rate in pigs. On a commercial pig farm, 398 finishing pigs in 50 pens (eight pigs/pen) were observed at 12 weeks of age using 2-min instantaneous scan sampling for 6 h during daytime. For 324 observed pigs, growth rate during the finishing period was known. The relationship between behaviours and growth rate during the finishing period was analysed with behaviour as explanatory variable in a mixed model. Results show that time spent giving behaviours, like oral manipulation, social nosing, aggression and belly nosing, was not related to own growth rate. Receiving behaviours, however, did relate to growth. Pigs that received more oral manipulation, observed as tail biting, ear biting and paw biting, grew less well ($P < 0.05$). Growth rate was 43 (± 17) g/d lower in pigs that received oral manipulation during more than 2% of the observations as compared to pigs that did not receive oral manipulation. Pigs that received social nosing, a gentle touch or sniff at any part of the body, had a higher growth rate ($P < 0.05$): growth rate differed 29 (± 17) g/d between pigs that received social nosing during more than 2% of observations as compared to not receiving social nosing at all. Receiving aggression and belly nosing, a forceful rubbing of the belly, did not influence growth rate. In conclusion, receiving oral manipulation and social nosing related to growth rate. This suggests that pigs selected for positive social genetic effects for growth may potentially show behavioural changes. Effects of selection for social genetic effects on behaviour and growth will be studied in future research.

1. Introduction

Pigs, being social group-living animals, may affect each other's health, welfare and growth rate through their social behaviour. The effect of a pig on the growth rate of its pen mates is partly heritable and is referred to as its social genetic effect (Bergsma, 2011; Chen et al., 2007; Muir, 2005). Social genetic effects, also known as indirect

* Corresponding author at: Adaptation Physiology Group, Department of Animal Sciences, Wageningen University, P.O. Box 338, 6700 AH, Wageningen, The Netherlands. Tel.: +31 317 486415; fax: +31 317 483962.
E-mail address: Irene.camerlink@wur.nl (I. Camerlink).

0168-1591/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.applanim.2012.09.004

genetic effects (Moore et al., 1997; Wolf et al., 1998), have been found in a number of livestock species (reviewed in Bijma, 2011), in natural and laboratory populations (e.g. Wilson et al., 2009), and in plant breeding and forestry (e.g. Cappa and Cantet, 2008), and have become an important research topic in recent years. In pigs, social genetic effects for growth, i.e. the inherited effects an individual has on the growth of its group members, are hypothesized to be related to behaviour (Rodenburg et al., 2010). If social genetic effects are indeed related to behaviour, then genetic selection for social genetic effects for growth would offer a method to indirectly select on behaviour. This would be complementary to direct selection against specific undesired behaviours like aggression (Turner, 2011), without the need for large scale behavioural phenotyping. Social behaviours of pigs, however, are rarely studied in relation to growth of their group members. To gain insight in the mechanisms underlying social genetic effects for growth, it is first important to understand the effect of behaviours on growth rate in pigs.

Pigs in nature show an organized social structure with formation of groups (Stolba and Wood-Gush, 1989). Pigs kept in intensive housing systems show behavioural changes due to the inability to express their natural behaviour (Hughes and Duncan, 1988). Especially in barren and confined housing, with a lack of suitable substrates for foraging and rooting behaviours, pigs may show oral manipulation of their pen mates, such as tail biting (Van Putten, 1979). Tail biting may reflect stress and poor welfare of the biters (Van Putten, 1979) and can have negative consequences for health, welfare and growth rate of the receivers (Gonyou, 1993). A few studies have reported a growth reduction due to severe tail biting wounds (England and Spurr, 1967; Sinisalo et al., 2012; Wallgren and Lindalh, 1996). Management practices like grouping unfamiliar pigs can cause excessive aggression (Ewbank and Meese, 1971). A growth reduction due to social stress related to grouping unfamiliar pigs has been reported (Hyun et al., 1998; Stookey and Gonyou, 1994). Under stable social conditions, pigs do not engage much in injurious mutual fighting, but series of head knocks and bites may occur (Bolhuis et al., 2005). Both tail biting and aggression are moderately heritable in finishing pigs, with h^2 0.05–0.27 for tail biting in Landrace pigs (Breuer et al., 2005) and h^2 0.08–0.43 for post-mixing aggression (Turner et al., 2009). Positive behaviours between pigs, such as play and social grooming, are less well studied (Boissy et al., 2007), and their effects on health and growth are, to the best of our knowledge, unknown.

As hypothesized, the effect of behaviours on growth rate may underlie the estimated social genetic effects for growth in pigs. Knowledge on the possible relationships between negative, as well as positive, behaviours and growth rate is of great importance to validate this hypothesis. Besides the few studies on oral manipulation and aggression, however, evidence for a relationship between behaviours and growth rate in pigs is lacking. The objective of this study, therefore, was to investigate whether and how behaviours (given and received) are related with growth rate in finishing pigs. Hereto, growth data of finishing pigs were combined with behavioural observations.

2. Materials and methods

2.1. Animals and housing

Over four batches, behaviours of 398 crossbred finishing pigs from different genetic lines were observed. Batches were separated by a period of three weeks. Piglets were born and kept at an experimental commercial farm (IPG Beilen, The Netherlands). All piglets were tail docked and male piglets were castrated. At 26 days of age, piglets were weaned and placed in nursery groups of approximately 30 individuals of the same sex (female or castrated male) and a similar weight. Five weeks thereafter, pigs were moved to 50 finishing pens, distributed over seven compartments in the same farm building. Each nursery group was split into four finishing groups, to limit aggression due to grouping of unfamiliar pigs. Each finishing pen housed ~eight pigs of the same sex. Pens had half slatted floors with a space allowance of 1.0 m^2 per pig, and contained a metal chain with a galvanized polyurethane ball (75 mm diameter) placed on pig eye-height. Pen design did not allow pigs to interact with neighbouring pigs. Dry pelleted commercial feed was offered *ad libitum* from a single space feeder. Water was continuously available from a single nipple drinker per pen. Lights were on from 7:00 till 17:30 h. The experimental facilities were under supervision of The Institutional Animal Care and Use Committee of the University of Groningen, The Netherlands, which approved all protocols on the farm.

2.2. Behavioural observations

Behaviours of individual pigs were recorded at 12 weeks of age, three weeks after the start of the finishing period. A distinction was made between given and received behaviours (Table 1). Each pig was identified by a number which was spray marked on the back. Behaviour was scored during live observations using 2-min instantaneous scan sampling. Six hours of observation were carried out during the active period of the day, between 8:00 and 17:00 h, with a break from 11:30 to 13:30 h. This procedure resulted in 180 behavioural scans per pig (during 6 h every 2 min one scan). The Observer 5.0 software package (Noldus Information Technology B.V., Wageningen, The Netherlands) installed on a hand-held computer was used for behaviour recordings. Observations took place on two consecutive days. On the first day, half of the pens were observed at odd hours and the other half at even hours. On the second day this was reversed. Observations were performed by a single observer.

2.3. Growth data and breeding value estimates

Data on growth rate from the start of the finishing period (eight weeks of age) till slaughter (26 weeks of age, app. 110 kg live weight) were provided by the Institute for Pig Genetics BV. Growth rate was expressed in grams per day (g/d). Due to 12 missing ear tags and 62 missing growth records, 74 animals were excluded from the analyses on growth rate. Estimated breeding values for direct and social genetic effects, based on realized growth rate