Personality assessment of different horse breeds trained for military purposes

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Abstract. Behaviour traits play important role in horse used for military purposes. The aim of this study was to assess the personality of different horse breeds which trained for military purposes in Cavalry Detachment, Parongpong, Bandung, West Java. This study was performed on 40 trained horses which comprised of 20 Thoroughbred (Tbh), 10 Andalusian and 10 Unknown and on 25 non trained horse as control, which comprised of 5 Tbh, 15 Andalusian and 5 Unknown. The Horse Personality Questionnaire (HPQ), a 25 item rating method, was used to assess the horse personality of 3 horse breeds in two groups, by adjusting into 15 characters due to housing management circumstances. Principal component analysis (PCA) on HPQ data has identified five underlying personality components in observed horses. These were Dominance, Anxiousness, Stereotype, Liveliness, and Inquisitiveness. Further, Kruskal Wallis procedure was employed to observe the personality differences among breeds and training status. The PCA result showed that there are five principal components which explained most of the variance in the datasets (73.4% and 74.86% for trained and non-trained horses, respectively). Kruskal Wallis results showed that breed and training status affecting seven of the applied 15 HPQ characters: Apprehensive, curious, eccentric, equable, fearful, protective and suspicious. Equable, protective and suspicious traits were only affected by training status regardless the horse breeds. We conclude that the variation of horses' behaviour among breeds and training status existed.

1. Introduction
Horse (Equus caballus) has become part of human life for over 6000 years and serving various functions such as human’s food, working, herding, sport, entertainment and even warfare (military/cavalry) [1]. Domestication of horses has many different purposes, resulting domestic horses has various morphological types, physical characteristics and breeds [2]. Selection process not only focus on physical characteristic such as speed, size and strength [2] but also on its behaviours [3,4].

Horse personality is important part in selection process, because personality is an indicator that makes individuals unique. It can be defined as the characteristics of individuals who have responsibility for a consistent patterns of feeling thinking and behaviour [5]. The phenomenon of how and why individuals have different personalities is an interesting thing to explore further. Personality assessment on horses can be done by using subjective questionnaires to observe individual behaviour in various situations [6–11] or conducting individual classifications and assessments [6,7,12–17].
Personality traits, especially in domesticated horses, play an important role because it influences their comfortable as riding partner [18]. In addition, there is no much research explaining the acceptance of the temperament and personality of the horse to its quality as a riding horse. Therefore, in the future, this sector needs to be scrutinized especially in terms of conducting temperament testing.

In general, horse personalities can be classified into six, Dominance, Anxiousness, Stereotype, Liveliness, Inquisitiveness and Protection [2]. Every horse breeds has a distinctive behaviour and different personality [19]. Lloyd's [2], identified that Anxiousness and Excitability are the most variation between breeds, while Protection and Dominance show small variations.

As a role in warfare, Cavalry is soldiers fighting on horseback on the battlefield. Although not widely used, nowadays, some countries still maintain small units of cavalry for ceremonial, patrol and educational purposes. Military horses are trained to have various special skills, so they are will be have unique personalities. Therefore, this study was aimed to assess the personality of different type of horse breed which trained for military purposes in Cavalry Detachment, Bandung, Indonesia.

2. Materials and Methods
A total of forty military trained horses was used in this study, which consisted of twenty Thoroughbred (Tbh), 10 Andalusian (A) and 10 Unknown (Un); and twenty-five non-trained horses which consisted of 5 Thoroughbred, 10 Andalusian and 5 Unknown. The horses belong to Cavalry Detachment, Parongpong, Bandung, West Java, Indonesia.

Questionnaire design. Horse Personality Questionnaire (HPQ) was used to assess horse personality in this study [19], a 25 rating method, adjusted into 15 characters (personalities) (Table 1) due to housing management circumstances. There was no different questionnaire format was used to assess for all breeds.

| No. | Personality component | Behavioural definition |
|-----|-----------------------|-----------------------|
| 1   | Active                | Constantly moving, does not like being still for long |
| 2   | Aggressive            | Cause harm or potential harm to other individuals, display signs of aggression, both horse and human |
| 3   | Apprehensive          | Seems to be anxious about everything, fears or avoids any kind of risk |
| 4   | Curious               | Readily explores new situations |
| 5   | Eccentric             | Shows stereotypes, unusual mannerisms and exaggerated behaviour |
| 6   | Equable               | Easy to handle, calm way; not easily disturbed |
| 7   | Excitable             | Over reacts to any change, easily excited, highly strung |
| 8   | Fearful               | Retreats readily from others or from outside disturbances |
| 9   | Insecure              | Hesitates to act alone; seeks reassurance from others |
| 10  | Irritable             | Reacts negatively with little provocation |
| 11  | Protective            | Prevents harm or possible harm to others |
| 12  | Slow                  | Moves and rests in a relaxed manner, moves slowly and deliberately, not easy hurried |
| 13  | Sociable              | Seeks companionship of others |
| 14  | Suspicious            | Does not trust others readily (human and horse), trusts few individuals |
| 15  | Stubborn              | Does not give in easily, not very cooperative |

Direct assessment using HPQ. Horses were scored on each personality using a 5 points with a score one represented no expression and a score five represented total expressions, thus three represented and ‘average’ or intermediate score. Horses were observed from 11.00 a.m. until 03.00 p.m., in three weeks. Each horse was assessed three times.

Calculation of component scores and statistical analysis. Calculation of the component scores for individual horse are using the horse personality model that developed by Lloyd et al. [19]. Eigen value
criterion (i.e. eigenvalue should more than one), scree plots and variability each component were used to determine the extracted components. Data was subjected to PCA analysis by using SPSS program. Further, Kruskal Wallis procedure was employed to observe the personality differences among breeds and training status, using R programing language.

3. Results and Discussion

3.1. Personality assessment

Result showed that Principal Component Analysis (PCA) on Horse Personality data has identified five underlying personality components in observed horses. These were Dominance, Anxiousness, Stereotype, Liveliness, and Inquisitiveness. Table 2 and Table 3 show the traits for each personality components for trained horses.

Table 2. Personality traits of trained horses

| Personality component | Dominance | Anxiousness | Stereotype | Liveliness | Inquisitiveness |
|-----------------------|-----------|-------------|------------|------------|-----------------|
| Equable               | Aggressive| Eccentric   | Active     | Slow       | Curious         |
| Excitable             | Irritable |             |            |            |                 |
| Stubborn              | Protective|             |            |            |                 |
| Apprehensive          | Sociable  |             |            |            |                 |
| Insecure              | Suspicious|             |            |            |                 |
| Fearful               |           |             |            |            |                 |

4.67<sup>a</sup>  2.85<sup>a</sup>  1.28<sup>a</sup>  1.15<sup>a</sup>  1.06<sup>a</sup>
31.14<sup>b</sup>  50.16<sup>b</sup>  58.70<sup>b</sup>  66.39<sup>b</sup>  73.44<sup>b</sup>

<sup>a</sup>Eigenvalue
<sup>b</sup>Cumulative (%)

Traits of Equable, Excitable, Stubborn, Apprehensive, Insecure and Fearful contributed the Dominance behaviour component in trained horses. While for non-trained horses, Apprehensive, Curious, Stubborn, Protective, Suspicious and Insecure contributed the Dominance behaviour component. Anxiousness behaviour component in trained horses were contributed by Aggressive, Irritable, Protective, Sociable and Suspicious; while for non-trained horse, were contributed by Sociable, Equable and Eccentric ones. Stereotype behaviour of trained horses was indicated by Eccentric trait, and non-trained horse was indicated by Irritable trait.

Table 3. Personality traits of non-trained horses

| Personality component | Dominance | Anxiousness | Stereotype | Liveliness | Inquisitiveness |
|-----------------------|-----------|-------------|------------|------------|-----------------|
| Fearful               | Sociable  | Irritable   | Active     | Excitable  | Aggressive      |
| Apprehensive          | Equable   |             |            |            |                 |
| Curious               | Eccentric |             |            |            |                 |
| Stubborn              |           |             |            |            |                 |
| Protective            |           |             |            |            |                 |
| Suspicious            |           |             |            |            |                 |
| Insecure              |           |             |            |            |                 |

4.76<sup>a</sup>  2.15<sup>a</sup>  1.64<sup>a</sup>  1.44<sup>a</sup>  1.22<sup>a</sup>
31.83<sup>b</sup>  46.17<sup>b</sup>  57.13<sup>b</sup>  66.71<sup>b</sup>  74.86<sup>b</sup>

<sup>a</sup>Eigenvalue
<sup>b</sup>Cumulative (%)
Liveliness behaviour component of trained horses were contributed by *Active* and *Slow* traits; while for non-trained horses were contributed by *Active*, *Excitable* and *Slow* traits. *Curious* and *Aggressive* indicated the Inquisitiveness behaviour component of trained horses and non trained horses, respectively.

3.2. Differences among breeds

Table 4 shows Kruskal Wallis results on personality traits among breeds and between training statuses.

| Personality trait | Breed and training status          | Mean   | p value |
|-------------------|-----------------------------------|--------|---------|
| Active            | Andalusian trained                | 30.45  | 0.74    |
|                   | Andalusian non-trained            | 33.43  |         |
|                   | Tbh trained                       | 33.48  |         |
|                   | Tbh non-trained                   | 39.50  |         |
|                   | Unknown trained                   | 33.50  |         |
|                   | Unknown non-trained               | 30.45  |         |
| Aggressive        | Andalusian trained                | 25.45  | 0.06    |
|                   | Andalusian non-trained            | 38.07  |         |
|                   | Tbh trained                       | 27.85  |         |
|                   | Tbh non-trained                   | 38.70  |         |
|                   | Unknown trained                   | 31.50  |         |
|                   | Unknown non-trained               | 50.80  |         |
| Apprehensive      | Andalusian trained                | 27.40<sup>bc</sup> | <0.01 |
|                   | Andalusian non-trained            | 43.27<sup>ab</sup> |         |
|                   | Tbh trained                       | 27.60<sup>bc</sup> |         |
|                   | Tbh non-trained                   | 45.40<sup>a</sup> |         |
|                   | Unknown trained                   | 22.60<sup>c</sup> |         |
|                   | Unknown non-trained               | 43.40<sup>ab</sup> |         |
| Curious           | Andalusian trained                | 24.87<sup>bc</sup> | 0.03    |
|                   | Andalusian non-trained            | 42.60<sup>a</sup> |         |
|                   | Tbh trained                       | 31.10<sup>abc</sup> |         |
|                   | Tbh non-trained                   | 36.48<sup>ab</sup> |         |
|                   | Unknown trained                   | 38.15<sup>ab</sup> |         |
|                   | Unknown non-trained               | 15.90<sup>c</sup> |         |
|                   | Andalusian trained                | 21.40<sup>ac</sup> | 0.03    |
| Eccentric         | Andalusian non-trained            | 26.83<sup>bc</sup> |         |
|                   | Tbh trained                       | 35.83<sup>ab</sup> |         |
|                   | Tbh non-trained                   | 46.90<sup>a</sup> |         |
|                   | Unknown trained                   | 36.05<sup>ab</sup> |         |
|                   | Unknown non-trained               | 43.40<sup>ab</sup> | <0.01   |
| Equable           | Andalusian trained                | 42.40<sup>a</sup> |         |
|                   | Andalusian non-trained            | 22.60<sup>b</sup> |         |
|                   | Thoroughbred trained              | 40.85<sup>a</sup> |         |
|                     | Thoroughbred non-trained | Unknown trained | Unknown non-trained |
|---------------------|--------------------------|----------------|---------------------|
| Thoroughbred non-trained | 19.90<sup>b</sup>         |                 |                     |
| Unknown trained          | 35.50<sup>a</sup>         |                 |                     |
| Unknown non-trained     | 16.10<sup>b</sup>         |                 |                     |
| **Excitable**          |                          |                 |                     |
| Andalusian trained      | 32.20                     | 0.44           |                     |
| Andalusian non-trained  | 31.40                     |                 |                     |
| Thoroughbred trained    | 34.60                     |                 |                     |
| Thoroughbred non-trained | 31.40                   |                 |                     |
| Unknown trained         | 28.20                     |                 |                     |
| Unknown non-trained     | 44.20                     |                 |                     |
| **Fearful**            |                          |                 |                     |
| Andalusian trained      | 29.55<sup>bc</sup>        | <0.05          |                     |
| Andalusian non-trained  | 40.40<sup>ab</sup>        |                 |                     |
| Thoroughbred trained    | 24.83<sup>c</sup>         |                 |                     |
| Thoroughbred non-trained | 41.30<sup>ab</sup>       |                 |                     |
| Unknown trained         | 27.35<sup>bc</sup>        |                 |                     |
| Unknown non-trained     | 53.40<sup>a</sup>         |                 |                     |
| **Insecure**           |                          |                 |                     |
| Andalusian trained      | 32.85                     | 0.34           |                     |
| Andalusian non-trained  | 39.33                     |                 |                     |
| Thoroughbred trained    | 28.83                     |                 |                     |
| Thoroughbred non-trained | 40.80                   |                 |                     |
| Unknown trained         | 26.40                     |                 |                     |
| Unknown non-trained     | 36.40                     |                 |                     |
| **Irritable**          |                          |                 |                     |
| Andalusian trained      | 26.50<sup>b</sup>         | 0.06           |                     |
| Andalusian non-trained  | 41.00                     |                 |                     |
| Thoroughbred trained    | 27.20                     |                 |                     |
| Thoroughbred non-trained | 42.60                   |                 |                     |
| Unknown trained         | 30.40                     |                 |                     |
| Unknown non-trained     | 27.20                     |                 |                     |
| **Protective**         |                          |                 |                     |
| Andalusian trained      | 26.50<sup>b</sup>         | 0.03           |                     |
| Andalusian non-trained  | 41.83<sup>a</sup>         |                 |                     |
| Thoroughbred trained    | 28.90<sup>b</sup>         |                 |                     |
| Thoroughbred non-trained | 34.50<sup>ab</sup>      |                 |                     |
| Unknown trained         | 27.45<sup>b</sup>         |                 |                     |
| Unknown non-trained     | 45.50<sup>a</sup>         |                 |                     |
| **Slow**               |                          |                 |                     |
| Andalusian trained      | 33.00                     | 0.58           |                     |
| Andalusian non-trained  | 30.87                     |                 |                     |
| Thoroughbred trained    | 34.60                     |                 |                     |
| Thoroughbred non-trained | 33.00                   |                 |                     |
| Unknown trained         | 33.00                     |                 |                     |
| Unknown non-trained     | 33.00                     |                 |                     |
| **Suspicious**         |                          |                 |                     |
| Andalusian trained      | 26.05<sup>b</sup>         | <0.01          |                     |
| Andalusian non-trained  | 45.40<sup>a</sup>         |                 |                     |
| Thoroughbred trained    | 26.13<sup>b</sup>         |                 |                     |
| Thoroughbred non-trained | 34.20<sup>ab</sup>     |                 |                     |
| Animal Type | Breed | Trait | Subtraits | Variation |
|------------|-------|-------|-----------|----------|
| Unknown trained | 28.20 | 45.60 | a,b,c | 0.08 |
| Unknown non-trained | | | | |
| Sociable | Andalusian trained | 38.90 | | 0.15 |
| Andalusian non-trained | | | | |
| Thoroughbred trained | | | | |
| Thoroughbred non-trained | | | | |
| Unknown trained | | | | |
| Unknown non-trained | | | | |

Different superscripts indicate significant differences between groups in each trait.

The results showed that breed and training status affecting seven of the applied 15 HPQ characters: Apprehensive, Curious, Eccentric, Equable, Fearful, Protective and Suspicious. In all groups of breed and training status, the horses have about similar level of aggressive, however Andalusian are significantly more apprehensive regardless the training status. Equable, Protective and Suspicious traits were only affected by training status regardless the horse breeds.

All trained horses have a low level of Apprehensive and Fearful. We suspect this is related that trained horses more often interact with humans so that fear and anxiety are reduced. Military horses are trained to still calm in harsh conditions such as fireworks, war or tumultuous crowds [20]. Then, trained horses have a quick response to stimuli, result that they are not easily shocked and fear [21]. The trained thoroughbred has the lowest fearful level which shows that thoroughbred is one of the breed that has a calm characteristic [22]. Furthermore, Equable, Protective and Suspicious traits were only affected by training status regardless by the horse breeds. The trained horse has better calm way, didn’t easy disturbed, lower protective and suspicious properties than non-trained horse. This traits are affected by various stimuli along the horse's live, for example, how many rider have been a riding its horse [23].

Andalusian horses have low Eccentric level compared to other horses in both trained and untrained conditions. Eccentric trait is an undesirable behaviour of military horse. We suspect that Andalusian horses do not have high eccentric traits genetically. This is because each breed carries the various characteristics [24]. On the other hand, training status on Andalusian horses can reduce the Curious trait of the horse but actually increases the unknown horse. It is showed that the response of each breed to the stimulus is different, resulting in different personalities [2].

4. Conclusion
Principal component analysis (PCA) on Horse Personality Questionnaire data has identified five underlying personality components in observed horses: Dominance, Anxiousness, Stereotype, Liveliness, and Inquisitiveness which were contributed by 15 different structure of traits for trained and non-trained horses. The variation of horses’ behaviour among breeds and training status existed.

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