

Equine-Assisted Activities for Adolescents: Ethogram-based behavioral analysis of persistence during horse-related tasks and communication patterns with the horse

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Earlier studies have indicated that learning to handle a horse through tasks and activities can lead to a feeling of mastery which may have an impact on self-efficacy. The aim of this study was to examine how adolescents conducted horse-related tasks presented to them in an intervention in a farm environment, and whether there was a change during the intervention in persistence on tasks with the horse. Furthermore, we wanted to examine the behavior of the adolescents towards the horse and the response from the horse. Each participant was given an intervention once a week for approximately 16 weeks consisting of tasks with the horse, riding, grooming, and stable work. The sample presented in this study consisted of 29 participants who were successfully video-recorded in the beginning and at the end of the intervention. Petting the horse was the most frequent way of initiating contact with the horse, and the distributions of contact behaviors were the same at both time spots. The response of the horse was mainly neutral or positive. When participants did not succeed at their first attempt when trying to solve a horse-related task or an exercise during riding, their subsequent behavior was recorded as either trying again or not trying again. Early in the intervention, these two options were chosen with about the same frequency, while at the end of the intervention trying again was chosen significantly more often than not trying again. This was operationalized as an increase in persistence when having difficulties in solving tasks with the horse. The increased persistence late in the intervention in retrying tasks may indicate that the adolescents developed a feeling of mastery, which is an important factor in development of self-efficacy.

Keywords: adolescents, horses, intervention, mastery of task, equine-assisted activities

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Adolescent's Persistence During Equine-Assisted Activities and the Relation to Task-Specific Mastery

Interactions with horses may contribute to development of social skills and self-efficacy (Burgon, 2011; Forsberg & Tebelius, 2011; Keino et al., 2009; Traeen & Wang, 2006; Trotter, Chandler, Goodwin-Bond, & Casey, 2008). To understand why activities with horses may have a positive impact it is important to study the interaction process between the participant and the horse. In this study we wanted to analyze the experience of mastery with a typical group of adolescents through activities with horses. Methods of video analysis used in animal behavior research allowed us to investigate the interaction between the adolescents and the horses, and investigate development of mastery of tasks related to the horses during the intervention.

The horse in activities and therapy

Equine-assisted therapy (EAT) is a treatment of physical or mental disabilities with the horse as a co-therapist (Fine, 2010). In treatment of physical disabilities the horse works as a therapist to increase balance, stability, and flexibility in the patient's musculature (Bertoti 1988; Herrero, Asensio, Garcia, Marco et al. 2010; Davis, Davies, Wolfe, Raadveld et al., 2009). Equine-assisted therapy might also enhance rehabilitation from physical illnesses (Hakanson, Moller, Lindstrom, & Mattsson, 2009).

Equine-assisted psychotherapy is a means of equine-assisted therapy with a focus on mental health issues. Activities with the horse are performed by the participants to trigger a behavioral change and help solve emotional problems (Keino et al., 2009; Klontz, Bivens, Leinart, & Klontz, 2007; Lentini & Knox, 2008; Roberts, Bradberry, & Williams, 2004; Rothe, Vega, Torres, Soler, & Pazos, 2005; Schultz,

Remick-Barlow, & Robbins, 2007; Selby, 2009). Several studies show that the horse has a positive impact on children with learning disabilities and emotional problems (Braat, 2008; Burgon, 2011; Kaiser, Smith, Heleski, & Spence, 2006; Trotter, Chandler, Goodwin-Bond, & Casey, 2008). Burgon (2011) studied seven at-risk young people learning to handle the horse from the ground through different tasks during an intervention. The adolescents appeared to grow in self-confidence (measured through qualitative interviews) when able to communicate with the horse to solve the exercises.

Equine-assisted activities (EAA), like other animal-assisted activities (AAA), provide opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life, improvement in school subjects, or social behavior (Ewing, MacDonald, Taylor, & Bowers, 2007; Kaiser et al., 2006; Trotter et al., 2008). The horse in activities related to leisure may also have an impact on self-efficacy, although this is not the main goal of the activity (Forsberg, 2007; Forsberg & Tebelius, 2011; Traeen & Wang, 2006). Forsberg (2007) showed that 14 to 16 year old girls developed their identity through an experience of mastering activities with the horse. Forsberg used semi-structured interviews to examine girls' identity development through riding as a leisure activity, and followed the girls over time as they took part in stable work, horse-related tasks, and social interactions at the riding school. The girls in this study pointed out the importance of the horse in a task-related activity and how mastering tasks in relation to the horse influenced their beliefs in their own competence.

The farm may be used as a venue for health-promoting activities like what is termed green care, farming for health, social farming, or care farming (Sempik, Hine, & Wilcox, 2010). The farmer and the farm provide an environment with nature and animals with farm-related

activities for a diversity of people to promote health and well-being. The focus of this study is on the experience of activities with horses in a social environment on a farm, providing a natural setting with physical activities that holds elements of task achievement, all potentially important for adolescent development (Barber, Eccles, & Stone, 2001; Dodge & Lambert, 2009; Moote & Wodarski, 1997).

Self-efficacy

Self-efficacy is described as a person's belief that one can successfully produce the desired outcome by one's own actions (Bandura, 1997b). It is the belief that one can utilize one's abilities and skills in a certain situation to reach a specific goal (Maddux, 1995). Efficacy beliefs operate through impact on cognitive, motivational, and decisional processes (Bandura, 1997a). They determine whether a person thinks in a positive or negative way about accomplishing a task and how well they motivate themselves (Baumeister, Vohs, & Tice, 2007). The most important factor in the development of self-efficacy is personal experience with trying to master a task. Mastery requires skills or knowledge that helps one master the subject, for example putting a halter on a horse. Successful performance attempts will strengthen self-efficacy related to that specific behavior, while previous failures will weaken self-efficacy beliefs about being able to perform the behavior (Maddux & Volkmann, 2010). In a social setting with people similar to oneself, seeing others succeed may also enhance one's own belief in success (Bandura, 1982).

Self-efficacy beliefs are important because they influence the goals set, the choice of goal-directed activities, and the persistence when failing at a task. High self-efficacy leads to persistence when faced with difficulties, such as mastering a difficult task, and creates a willingness to try again when faced with challenges because of the belief of success. Low

self-efficacy on the other hand may lead to a less active behavior and belief that a task is harder than it actually is (Baumeister, 2004; Baumeister et al., 2007). In this study the focus will be persistence on performing a task. Task-specific mastery is related to the task at hand, but experiences of mastery during a specific task may strengthen self-efficacy beliefs in general, which again might help in daring to try new tasks in other social arenas (Bandura, 2006).

Leisure activities and the relation to self-efficacy

Leisure activities in general may promote self-efficacy in adolescents (Barber et al., 2001; Dodge & Lambert, 2009). Dodge & Lambert (2009) showed a positive association between participating in sports during adolescence and positive self-belief one year later, a concept similar to self-efficacy. Adventure-based activities may also have a positive impact on self-efficacy through task-specific activities that include cooperation, trust, communication, physical activity, and problem-solving (Moote & Wodarski, 1997). These are many of the same aspects found in activities with horses. In both qualitative and observational studies of equine-assisted activities and leisure activities with horses the participants have reported an increased belief of success and feeling of mastery through learning to master tasks with the horse. This has been interpreted as an indication that mastering tasks with the horse had an impact on self-efficacy beliefs (Burgon, 2011; Forsberg, 2007; Forsberg & Tebelius, 2011). Although studies that measured general self-efficacy directly did not find any change in the standardized measurement, the findings showed a decrease in problematic behaviors after participating in an intervention with horses and mastering tasks with the horse (Ewing, MacDonald, Taylor, & Bowers, 2007; Kaiser et al., 2006). Activities with horses may therefore have an influence on specific self-efficacy

beliefs through experience of mastery during potentially difficult tasks related to the horse.

Riding and interaction with horses are different from other leisure activities because of the interaction with a horse, giving a new type of interpersonal element and greater complexity to the activity. The prerequisites for mastery of tasks in relation to the horse are feeling safe in the situation and being able to communicate with the horse.

Interaction with the horse

In equine-assisted activities the qualities of the horse are used to achieve the goals of the intervention. Horses are prey animals and therefore very sensitive to their environment, responding readily to the behavior of those around them (Lentini & Knox, 2008; Smith-Osborne & Selby, 2010). Confidence in interacting with a horse is important with regards to success in getting it to cooperate (Burgon, 2011), and communication skills such as being clear and unambiguous are required (Traeen & Wang, 2006). To ensure a positive experience in relation to the horse, it is important to understand how the horse communicates (Birke, Hockenhull, Creighton, Pinno et al., 2011; Hausberger & Muller, 2002). The non-verbal communication often experienced with animals is especially prominent in an intervention with horses; the communication mainly happening through understanding of body language (Krueger, Flauger, Farmer, & Maros, 2011; Lentini & Knox, 2008). In equine-assisted psychotherapy, the behavior response from the horse is often used to improve communication and work on behavioral problems (Keino et al., 2009; Lentini & Knox, 2008; Trotter et al., 2008).

Physical contact, as non-verbal communication, with animals may have a calming effect on humans (Friedmann, Katcher, Thomas, Lynch, & Messent, 1983). Stroking a dog or having a dog present is shown to give

children comfort in conducting difficult tasks or in stressful situations (Beetz et al., 2011; Gee, Church, & Altobelli, 2010; Gee, Harris, & Johnson, 2007). Studies with animals other than horses have shown that stroking an animal may have a positive physiological effect on the human (Friedmann et al., 1983). Beetz et al. (2011) found that physical contact with a dog gave reduced cortisol level in a socially stressful situation. Stroking a dog is also shown to increase the oxytocin level through positive interaction, in both the human and the dog (Odendaal, 2000, Odendall & Meintjes, 2003). Learning to communicate with the horse through non-verbal communication and having physical contact with the horse may be important to increase the feeling of security and calmness during the intervention.

Analysis of behavior

Animal behavioral methodology drawn from ethology gives the opportunity to objectively study the communication between adolescents and horses and the conduct of tasks. In animal behavior studies video recording is a common method. Using animal behavior methodology, the response of the animal to the behavior of the person can be analyzed (Martin & Bateson, 2007).

Ethological methods were used previously to investigate mastery in relation to tasks with animals (Berget, Skarsaune, Ekeberg, & Braastad, 2007; Pedersen, Nordaunet, Martinsen, Berget, & Braastad, 2011). These studies investigated people with psychiatric problems working with farm animals. Both studies indicated that tasks conducted with animals may be related to increased self-efficacy in some cases. Video recordings and behavior analysis have also been used to examine other activities. A study of soccer players and their relation to their coach used an ethogram with gazing and talking behaviors in a similar manner as done in the current study (Toering et al.,

2011). As far as we know there is no previous study using video analysis in the same context as used in the present study. Gee et al. (2007) conducted a study using a scale measurement on video observations to investigate the level of motor skills among children when in presence of a dog. Beetz et al. (2011) used video analysis of behavior in relation to cortisol measurement to investigate if stress levels were reduced during physical contact with a dog. In horse-assisted activities, a custom-designed psychosocial session form (PSF) has been used to analyze behavior of adolescents in relation to horses (Braat, 2008; Trotter et al., 2008). The PSF records behaviors like looking at the horse, making contact, participating, grade of leadership, fear, and positive interactions. Measuring the interaction between horses and adolescents and investigating mastery of potentially difficult tasks with horses by use of video analysis brings a new aspect to the field, which may have implications for studies on equine-assisted activities.

Aim of the study

In this study we wanted to investigate the recorded activity patterns of adolescents during a four-month intervention with horses on a farm. The first aim was to investigate persistence during challenging tasks, by focusing on behaviors chosen after unsuccessful completion of a task after the first attempt. The second aim was to examine the communication pattern between the adolescent and the horse; that is, the interaction initiated by the adolescents towards the horse and the response of the horse to this interaction.

Methods

Participants and procedures

The participants were Norwegian adolescents between 12 and 15 years recruited through secondary schools. Ten schools were

selected to be part of the project due to proximity to the selected farms where the interventions took place. The principals at the schools were contacted and informed about the project, and they approved the school's participation. The first author presented the project for each class in the first and second year at the selected schools to a total of approximately 150 adolescents at each school. The adolescents were given a brochure and information letter with detailed information about the project. A signed informed consent form was required in accordance with national ethical guidelines. Consent forms were signed by both the adolescent and their parent/guardian. Eighty students gave consent to participate in the project. All participants were offered an intervention with horses either in the spring or fall during 2009, 2010, or 2011. Five of the adolescents dropped out before the intervention started. None of the adolescents dropped out during the intervention, however. The 75 participants were randomly divided into intervention (group 1) and control (group 2) groups. Group 2 functioned as a waiting-list control group, beginning their intervention four months later. Four months after the end of their intervention Group 1 served as a follow-up group. All participants were given questionnaires before and after their intervention and either four months before or four months after their intervention. Half of the adolescents were filmed early and/or late in their intervention. The questionnaire data are not reported in this paper. In this study only those who were video-recorded both early and late in their intervention are used (N=29). The participants (10 boys and 65 girls) averaged 13.5 years old. They all attended their first (N=51) or second year (N=24) at their Junior High School (aged 13-15 years). Forty-five of the adolescents had little or no experience with handling horses while 30 had been riding before, well distributed between the two groups. All the adolescents had

seen a horse before, and was motivated to learn more about handling horses. The adolescents all had access to a support system at their school, well informed about the project. The support system consisted of the principal, the contact teacher and a health professional at the school, all being aware of the project and ready to assist the participants if needed. To our knowledge, the support system was never used.

To avoid the performance pressure often found at riding schools, small farms were used as the venue for the interventions. The farms were selected by inclusion criteria related to the farm size, the country surroundings, proximity to a school, the stabling conditions for the horses, and the competence of the farmer. The criteria for the farms were: a total size of fewer than 25 acres, no more than 10 horses, situated in the country side less than 5 km from a Junior High School, and with natural surroundings. All the farms allowed their horses plenty of free movement and social contact with other horses, and most of the stables had an outdoor-stable system. The farms had cats, dogs, laying hens, goats, or sheep in addition to the horses. These were not part of the intervention, though some occasional contact occurred. None of the farms had other large animals like cows. Ten farms in Eastern Norway from the counties of Hedmark, Oppland, Buskerud, and Vestfold were selected to be part of the project.

The farmers functioned as instructors. When farms were selected the inclusion criteria for the farmers were: (a) having worked with adolescents and horses during the past year, (b) having such experience for at least a year, or (c) being a riding instructor and having some kind of education in health or pedagogy. The riding-instruction competence ranged from self-taught experience to education at a national level. The education in social work or pedagogy, ranged from fully educated teacher or health practitioner to minor courses in psychology or

pedagogy. There were nine women and one man.

The horses used for the project were of Norwegian breeds or Icelandic horses, all cold-blooded horses which are known for their calm temperament and steady gaits. These were chosen due to their good temperament and steadiness often found in these breeds. All horses were kept in a herd, allowed social interaction with other horses, and were able to move freely over a large area. They were given free access to straw feed and most of them were kept bare footed. All these factors have been found to be important for the welfare and behavior of the horse and to ensure a calm and safe experience for the participants (Hartmann, Søndergaard, & Keeling, 2012; Lesimple et al., 2011; Søndergaard & Ladewig, 2004).

The project was approved by The Regional Committee for Medical Research Ethics (REK) and the Norwegian Data Protection Official for Research.

Study sample

In order to be able to observe changes in task performance and communication patterns, some of the participants were filmed both early and late in their intervention. The selection of adolescents to be filmed was made using practical considerations. As many as possible were filmed, but due to simultaneous sessions at different farms and long travel distances between farms, some had to be excluded. The adolescents filmed early in their intervention were the same as those filmed late in their intervention, aiming at filming as many as possible at both time periods. The adolescents and parents were also informed about the filming when they gave their consent. They were informed that the videotapes would be used only for the purpose of analyzing behavior through a computer program, and that the video material would be deleted when the project was finished. Filming was voluntary, and the participants were

free to drop out of the project at any time without giving any reasons or risking any consequences.

Of the 75 participants completing the intervention 46 participants were filmed either early or late in their intervention period. Fifteen participants were filmed early in their intervention but not late, and two of the participants were filmed late but not early. A total of 29 participants was filmed both early and late in their intervention and constituted the sample used in this study. There were four boys and 25 girls all between 13 and 15 years old, with an average of 13.5 years. A questionnaire on their prior experience with animals (N=25) showed that all but one had experience with pets (dogs, cats, or rabbits) before they started the project. Nineteen had experience with horses. Twelve of them had been riding before, while seven had sat on a horse a few times or visited friends at a stable. This sample did not differ substantially in gender, age, or experience with animals and horses from the 46 participants filmed either early or late, nor from the total group of 75 participants.

The intervention

The adolescents had a 2-hour session once a week for approximately 16 weeks. The farmers functioning as instructors were responsible for conducting the intervention guided by the researcher through an instruction letter, visits, and several conversations to make sure they understood how to conduct the intervention. The instruction letter gave specific details on how to implement the intervention, with examples of tasks in each of four categories of activities the adolescents would do in each session. The instructors decided which tasks from those categories the adolescents should carry out and when. The different activity categories were: (a) horse-related tasks, (b) riding or handling the horse from the ground, (c) grooming, and (d) stable work. Horse-related tasks ranged in

difficulty from easy to hard and included putting on a halter, leading the horse, getting the horse from the field, picking up the horse's feet and cleaning the hooves, and saddling the horse. Grooming the horse consisted of saying hello to the horse, brushing the horse, and sometimes plating mane and tale. Riding or handling the horse from the ground consisted of being able to steer the horse through different obstacles in the arena or going for a walk in the forest. The stable work category consisted of cleaning out the stables, giving the horse food and water, and making it tidy in the stable. Due to natural variations on a farm and varying weather conditions, the time spent on each category and activity differed, but the adolescents did some work in each category every time they came to the farm. The adolescents were assigned their own individual horses, and they kept the same horses as much as possible throughout the intervention. The intervention was all about the experience with the horse and not about becoming skilled at the activities.

Within this framework the instructors were encouraged to make an individual plan for progression during the intervention, and to provide different experiences for each adolescent for mastering tasks with the horse. This was dependent on weather conditions and the experience level of each adolescent. The progression during the intervention was accomplished by giving the adolescents more responsibility and challenges in tasks, particular during riding. The horse-related tasks varied in level of difficulty, the adolescents were therefore given the easiest tasks at the start and then progressed to tasks of increasing difficulty throughout the intervention. The level of difficulty during riding could vary from leading the horse through obstacles to riding by themselves and learning to steer the horse alone. The adolescents who had been riding prior to the study often had little experience with handling the horse in other settings, like saddling the

horse, therefore all adolescents met new challenges during the intervention. When the adolescents were unable to solve the task or exercise, they were given time to figure it out by themselves. If they did not try again by themselves they either gave up or asked for help to complete the task. The instructor was with them the whole time they were at the farm, so help was available when needed.

The instructors signed an agreement with the researcher stating their responsibility for the intervention. The researcher informed the adolescents about what the intervention would be like before they consented to participate in the project. In addition, the instructors informed the adolescents about the plan for the intervention during their first visit to the farm.

Analytic approach and data collection

Video-recordings. The adolescents were video recorded for the full two hours when on the farm by continuous sampling. This was carried out twice during the four-month intervention; at the second or third session in the beginning of the intervention, and at the third or second to last session at the end of their intervention. This was chosen to allow the adolescents time to get to know the farmer before filming was conducted and to ensure filming at the end of the intervention. The camera used was a high definition (HD) Sony Handycam with good resolution. Extra lighting was available if the filming was to take place during darkness. The two adolescents in the same session were filmed by one observer at the same time. At times where this was not possible the observer shifted between the two adolescents by an interval of 2 minutes. Four different observers instructed in the same way were used in the project. The camera was hand-held to be able to follow sudden changes of movements by the participants. The distance to the participants was approximately 2-3 meters to allow both participants in the picture as much as possible

when they conducted horse-related tasks, stable work or grooming, and five to fifty meters when riding.

Quantitative video-analysis. The videos were analyzed using The Observer[®] software (Noldus Information Technology, Wageningen, The Netherlands, www.noldus.com) which is mainly used for analyzing animal behavior. The Observer is an analyzing tool which makes analyses of behavior precise. This software utilizes an ethogram, a list of behavioral categories, made by the researcher, and adapted to the study of interest (Martin & Bateson, 2007). Each behavior has its own objective definition of what it includes and must be thoroughly evaluated before the analyzing process starts. Using The Observer behaviors may be measured as duration of time or in terms of frequency, i.e., number of occurrences per time unit.

The videos were analyzed separately for each adolescent. The activities conducted on the farm were registered as four different broad behavior categories: horse-related tasks, riding or handling the horse from the ground, grooming the horse, and stable work, as noted earlier (Table 1). Horse-related tasks consisted of all tasks connected to the horse. Grooming the horse was seen as an interaction and not a difficult task itself and was therefore kept as a separate category.

During horse-related tasks and riding, we scored specific secondary behaviors. We registered each occurrence (frequency of behavior) when the adolescent was unable to solve the task or exercise given to them by the instructor. The criteria for noting “not able to solve the task” were if the adolescent paused in the task or exercise due to the horse or the adolescent not understanding what to do. When “not able to solve the task” was registered we wanted to investigate the action taken next by the adolescent. One of three options was noted: (a) trying again to complete the task, (b) giving

up on the task, or (c) asking for help to solve the task. The two last categories were combined into not trying again in the further analysis. The goal of the analysis was to measure persistence with the task and not success on the task, although trying again often lead to successful completion of the task. The behaviors used in the analysis are described in figure 1.

During grooming and horse-related tasks the contact initiated by the adolescents towards the horse was recorded. This was noted as physical, verbal, or eye contact. If the adolescent petted the horse physical contact was registered. If the adolescents clearly talked to the horse verbal contact was registered. If the adolescent clearly looked towards the head of the horse eye contact was registered. More than one type of these contact behaviors could be recorded at the same time. If two occurrences of the same type of contact behavior initiated by the adolescent were close in time, a minimum interval of 5 seconds was used before the next occurrence could be recorded. When the adolescents chose to pet, talk, or look at the horse, the response of the horse was registered using the position of ears and head. This occurred during grooming when the horse was tethered therefore other body signals were not registered. The categories for the response of the horse were: (a) ears pricked forward and/or turning the head in the direction of the adolescent, (b) ears relaxed to the side and head lowered, and (c) ears pinned backwards and/or head turned towards the adolescent raising the lips and showing teeth. The first category was used as a positive response, the second as neutral, and the third as a negative response.

Before video analyses, selected videos were viewed by two observers, the first and the third author, to discuss how “unable to solve the task”, “trying again” and “not trying again” should be defined. A description for each behavior was made (Table 2). Videos were then analyzed separately by the observers, except in

instances where there was doubt, and they were then rated by the observers together. Most of the videos were viewed in part by each of the observers, to ensure that both observers took part in the analysis of each participant.

Results

Activities on the farm

The duration of time spent in each activity category (horse-related tasks, riding, grooming, and stable work) was divided on total time recorded for each adolescent in that session to obtain the fraction of time spent in each activity for each adolescent in the video recorded session. Means and standard deviations of the percentage distribution of activities (time budget) performed during the early and the late sessions are presented in Figure 2. The adolescents spent most of their time with the horse conducting horse-related tasks, through riding and grooming. Less time was spent on stable work. There was a pronounced individual variation in the distribution of work tasks during both time periods, as illustrated by the standard deviations. Some of this may be attributed to the weather conditions, as during extreme weather conditions the adolescents had to do more grooming and stable work that day. No significant differences were found between early and late parts of the intervention (See Figure 2).

Contact with the horse and the response from the horse

The numbers of times the adolescent petted, looked at, or talked to the horse were divided by total time in hours spent on horse-related tasks and grooming to calculate the frequency per hour of each contact variable. The different types of contact the adolescents initiated with the horse while doing horse-related activities and grooming is presented in figure 3. Petting the horse was the most frequent type of contact initiated by the adolescents,

constituting 75% of all contact behavior. A paired sample t-test was conducted to compare petting with eye and verbal contact combined. Petting was performed significantly more frequent than eye or verbal contact combined during both early (T1: Petting: $M = 45.2$ $SD = 31.9$, Eye/Verbal: $M = 15.1$ $SD = 19.8$; $t(28) = 8.68$, $p < .001$) and late recordings (T2: Petting: $M = 38.9$ $SD = 19.2$ Eye/Verbal: $M = 12.8$ $SD = 13.7$; $t(28) = 10.26$, $p < .001$). The amount of time spent on each type of contact did not vary between early and late recordings (See Figure 3)

The response from the horse was calculated for each contact variable and combined into total response from the horse for all contact variables. The distribution of responses from the horse was equal during early and late recordings. The responses from the horse in early and late sessions were therefore presented combined. The number of occurrences of each response type was divided by total time spent on horse-related tasks and grooming to obtain frequencies. The percentage distribution of these frequencies is presented in figure 4. The horse showed no response in 75.4% and a positive response in 24.2% of the cases. Only 0.4% negative responses from the horses were detected (See Figure 4).

Trying again or not trying again when unable to solve the task

To calculate the frequency of being “unable to solve the task” for each adolescent, the total number of occurrences was divided by total time (in hours) spent on horse-related tasks and riding. “Not able to solve the task” was noted more or less equal amounts of times in early ($M = 9.9$, $SD = 7.7$) and late ($M = 8.7$, $SD = 9.7$) recordings. When “not able to solve the task” was noted the observer waited for the action of the adolescent before recording trying again or not trying again.

“Not able to solve the task” and then “trying again” was regarded as one strategy,

while “not able to solve the task” and then “not trying again” was seen as another choice of strategy. The numbers of occurrences (frequency) of each of the two strategies were divided on the total duration (in hours) of horse-related tasks and riding combined for each adolescent to obtain the frequencies per hour of each strategy. The frequency per hour of trying again and not trying again in early recordings and in late recordings is presented in figure 5. Paired-sample t-tests were conducted to compare the variables “not able to solve the task and then trying again” and “not able to solve the task and then not trying again” in early recordings and in late recordings. In early recordings there was no difference in the frequencies of trying again or not trying again when not being able to solve the task (T1: Not trying again: $M = 6.4$, $SD = 8.6$, Trying again: $M = 8.1$, $SD = 6.7$; $t(28) = 1.15$, $p = .259$). In late recordings, however, a significant difference between strategies was found, trying again being chosen significantly more often than not trying again when not being able to solve the task (T2: Not trying again: $M = 3.1$, $SD = 5.0$, Trying again: $M = 11.0$, $SD = 11.9$; $t(28) = 3.83$, $p < .001$) (See Figure 5).

To study potential relationships between contact with the horse and persistence during horse-related tasks, Pearson correlations were used to measure coherence between the frequencies of petting the horse and the frequencies with which the adolescents tried again. No relations were found between the variables ($r(29) = .21$, $p = .28$).

Discussion

Activities and contact with the horse

The adolescents spent most of their time on horse-related tasks, riding, and grooming. This shows that that the intervention focused on activities that included contact with the horse, as the instructors were told to. The overall time used on the different activities was the same

during early and late recordings, though there was variation among the individual adolescents.

Petting the horse was the main type of contact the adolescents had with the horse, both early and late in the intervention. Studies with other animals have shown that stroking an animal has positive physiological effects on e.g., the HPA axis, the major stress axis, and oxytocin (Friedmann et al., 1983; Odendaal, 2000, Odendaal & Meintjes, 2003; Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012). Gee et al. (2010) showed that petting a dog gave security and calmness to children in a test situation enabling them to do the test better with fewer mistakes. Non-verbal communication like petting the horse may therefore have had a calming effect on the adolescent.

Emotional bond is created through closeness, petting, and grooming the animal (Bachi, Terkel, & Teichman, 2012; Crawford, Worsham, & Swinehart, 2006). The adolescents in this study showed a large interest in having contact with the horse and had the same horse each time. A feeling of connectedness with an animal might happen without owning the animal (Endenburg & van Lith, 2011). The adolescents having the same horse during their intervention might have been of importance. The level of attachment was not measured, but one might consider that a bond with the horse could have developed.

Positive contact with the horse due to the response from the horse being positive or indifferent may also have been important for the feeling of security. Although no correlation was found between the frequencies of physical contact with the horse and trying again when not being able to solve a task with the horse, the positive responses received by the horse may have been important for daring to try again.

With regard to the response of the horse to the contact behavior of the adolescents, it is important that the horse's response was calm. If the horses had been aggressive, the type of and

amount of contact might have been different. A review of the relationship between horses and humans points out the importance of animal husbandry for the behavior of the horse (Hausberger, Roche, Henry, & Visser, 2008). The horses we used were kept in herds, they had a good welfare, and they were mainly of cold-blooded Norwegian breeds. The positive reaction pattern of the horses may be related to these factors and indicate that choosing the right horses for the activity is important for the outcome.

The response from the horse was measured solely by ear and head positions. These are clear indicators of emotional state shown by the horse (McGreevy, 2006). In this study the horses were calm during the interaction with the adolescents, not showing much variation in behavior. This is probably due to the horse behavior being noted during grooming and horse-related tasks when the horses were held or tied-up.

Choice of strategy during tasks

Trying again when not being able to solve a task was interpreted as an act of persistence, while not trying again was a sign of less persistence of the task. The adolescents chose to try again more frequently during late recordings than they did during early recordings. As a result of this, mastery of activities with the horse might have developed during the intervention. This may have an impact on self-efficacy, as self-efficacy beliefs are related to the persistence when not being able to solve a task (Baumeister, 2004). Choosing the strategy trying again over not trying again significantly more often in the end of the intervention may therefore indicate a change in self-efficacy in relation to activities with the horse. This is in accordance with previous research that has reported that experiences of mastering tasks in relation to activities with horses may have an impact on self-efficacy (Burgon, 2011; Forsberg, 2007; Forsberg & Tebelius, 2011). This study only

investigated the experiences the adolescents had during the intervention regarding contact with the horse and conducting horse-related tasks. Persistence at a task in contrast to giving up or asking others for help is an action closely related to the self-efficacy literature and might therefore enhance the self-efficacy beliefs in relation to the specific task. This might again have an influence on the experience of mastery in other arenas. This study only investigated the experiences the adolescents had during the horse-related tasks in this intervention. Though an experience of mastery at a certain task is a positive experience for adolescents, this may not be transferable to other arenas directly.

Our study did not measure if the adolescents conducted the tasks faster or more correctly late in the intervention, but the level of persistence increased while the tasks were gradually made more difficult. The level of challenges during tasks with the horse was therefore the same early and late in the intervention for all the adolescents, and therefore, possible to compare.

The importance of the setting for development of mastery

Being on a farm with a horse, the aim was not to become skilled at the activity which may be the case at a riding school (Forsberg, 2007). The instructors on the farms were told to give the adolescents time to try for themselves when attempting horse-related tasks. This setting may provide a different experience of mastery than if the focus was on conducting the task quickly and correctly, which may need to involve more active correction by the instructor.

An environment perceived to be safe and relaxed is important for receiving a positive experience of an activity (Gano-Overway et al., 2009). Seven of our participants were interviewed about the impact of the environment on the experience, in a master thesis (Flatekval & Berge, 2010). This thesis concluded that the

natural environment, the surroundings, and the social setting were important for the adolescents in addition to the interaction with the horse.

An experience of a social support network may have an influence on competence beliefs and the level of performing at a given activity (Ahmed, Minnaert, van der Werf, & Kuyper, 2010). The support from the farmer may influence the experience of an intervention on a farm (Pedersen, Ihlebæk & Kirkevold, 2012). The instructors in our study acted as a supportive leader, allowing the adolescents to try by themselves. The farmer might thus have played an important role for the outcome of the intervention.

The adolescents had to make an active effort in conducting horse-related tasks. Two participants were at the stable together and attempted the same type of tasks at the same time. A personal active effort and seeing other people similar to oneself succeed are important for development of self-efficacy (Bandura, 1997a). This might have been important for an increased persistence during horse-related tasks.

Methodological considerations

Using ethological methods with video analyses to investigate the relation between horses and adolescents gives a broader perspective to behavior observations, combining ethological and psychological aspects of behavior. Video recordings as a method to capture human-animal interactions have several advantages. Video analyses based on a descriptive and objective ethogram reduces subjective interpretations of the prevalence of various behaviors, and provides the possibility to analyze the behaviors in frequency per hour and average duration of each behavioral state. The possibility to control the analysis done by others, by analyzing the same situation twice by different scientists, is a clear advantage, increasing the overall reliability of the study.

The difference between analyzing animal behavior and human-animal interactions is the ability to control the recording situation. In animal behavior studies the animals are often kept in smaller compartments which enable the researcher to record the behavior at a certain angle and range. This was not possible in our study. The reliability of the analysis however depends on the behaviors chosen for the ethogram. The behaviors observed in this study were possible to see at a distance and from different positions; this was therefore not a problem for the analysis.

Other studies using The Observer[®] software to analyze tasks with animals in relation to mastery have mainly used duration of each behavior or task (Berget et al., 2007; Pedersen et al., 2011). This software also gives the opportunity to analyze the number of times a behavior occurs and reactions to this. This gives an advantage when investigating the behavior of the adolescent in relation to the task conducted, and the reaction of the horse to the behavior of the adolescent. Studies investigating non-verbal communication with horses often use these types of standardized forms to analyze the behaviors of the person (Braat, 2008; Keino et al., 2009; Trotter et al., 2008). Using a standardized form for analyzing behavior has its strength when comparing results between studies. Using ethological methods through video analysis gives a broader perspective of behaviors and a possibility to analyze several behaviors in relation to each other.

The aim of our study was to analyze behaviors that were easy to detect and give an objective measurement. Videos might also be used to analyze behavior on a scale measure (Gee et al., 2007). The strength of using video and measuring frequency of behavior is the minimizing of a subjective interpretation. On the other hand, a more qualitative approach gives a broader perspective of the experience. In psychological studies video is often used to

study emotional reactions through facial expressions (Hamm, Kohler, Gur, & Verma, 2011; Kaulard, Cunningham, Bulthoff, & Wallraven, 2012). This gives a more detailed analysis of emotions and reactions, but on the other hand does not give clear behavior categories which were important for the present study.

Further research is needed to explore this method. Studies on how mastery of tasks measured through behavior methodology may be related to other measurements of self-efficacy are relevant.

Limitations

The main aim of the intervention was to give the adolescents an experience of being on a farm with horses as close to a natural setting as possible. The farms and farmers were carefully selected to create a common experience for all participants. Despite the venue for the intervention being as similar as possible and the intervention criteria explained in detail to the instructors, being in a natural setting makes it difficult to standardize the intervention completely. A detailed manual for the intervention was not made, but detailed instructions were given to the farmers conducting the intervention. Because this intervention was about the total experience and not focused on a specific goal or learning outcome the intervention was supposed to vary in activities.

The adolescents were filmed at a relatively short distance, but the camera was a small hand held camera with a monitor, allowing the recorder to keep the camera at the chest and have contact with the adolescents to minimize intimidation made by filming. The adolescents did seem to get used to the camera and carried on as usual according to the instructor.

All participants had some kind of experience with or knowledge of horses, ranging

from riding to petting a horse, before they started in the project. Experience of horses was limited to riding. Therefore many of the horse-related tasks, like putting on a halter and saddling the horse, were new to them. The tasks were also adjusted to the adolescent's level of experience. The adolescents participated in the project voluntarily, ensuring that the motivation for being around horses was present. Involvement and motivation have an influence on the outcome of interventions with animals (Melson, 2003). The results in this study are only valid for adolescents motivated to participate in such activities. Motivation is important for involvement in an activity. This might therefore have had an impact on the adolescents' persistence during horse-related tasks.

Different degrees of experience with horses did not appear to have an impact on the type of contact the adolescents had with the horse or the choice of strategy when not succeeding with the task. This indicates that the intervention itself held elements of experience of mastery for all adolescents regardless of experience level. The adolescents were filmed during the second or third time of the intervention. The first potentially insecure encounter with the horse was therefore not recorded.

Other animals on the farm could have been a distraction, but the adolescents did not have much contact with them.

The instructors had various backgrounds, but all had experience working with adolescents and horses and education both in horse-related subjects and in health or pedagogy. All the farmers acted as supportive leaders and allowed the adolescents time to try for themselves during horse-related tasks. The numbers of instructors and animals used in our study were high in relation to the number of participants data was collected for. Using different animals and different instructors conducting the intervention make it easier to distinguish the effects of an

intervention from effects of the conditions (Kazdin, 2011).

The noting of "not able to solve the task" and then trying again or not trying again during horse-related tasks and riding was thoroughly discussed by the researchers before conducting the analysis. The criteria for noting the behaviors were easy to detect, the behaviors either occurring or not occurring. Despite objective categories described in an ethogram, and discussions among the two raters on border cases, a certain bias in the results during coding of the video recordings cannot be completely ruled out. Calculation of inter-rater reliability and the use of completely independent raters were not done. This was not feasible in this study and may be seen as limitations to the conclusions. The methodology being quantitative in the observation of the behaviors is a strength, but the operationalizing of the outcome as an experience of mastery is a judgment made by the researchers. Trying to relate observed behavior through ethograms with psychological concepts brings a new aspect to the field in regards to how to investigate experiences of mastery during equine-assisted activities. This leads to opportunities for new research, but also challenges in the methodology development.

Conclusions

Adolescents that were given the opportunity to work with horses and ride once a week for four months showed the same active attitude and the same time budget of behavior both early and late in the intervention period. The adolescents showed a large interest in petting the horse. The horses provided a safe setting for the adolescents, by showing only positive or no responses to their initiation of contact. Later in the period the adolescents more persistently than earlier kept on trying to master difficult tasks with the horse rather than backing

out from the challenge. This indicates that the intervention might serve to enhance task-specific self-efficacy among the adolescents during activities with horses. Even though it was not measured in this study, experiences of mastery in one arena might lead to a positive belief in one self in other arenas, positive for adolescents' development.

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Table 1
Ethogram of Activities, Behaviors, and Responses as a Basis for Video Analyses

Activity	Description
Horse-related tasks	Putting on a halter, cleaning hooves, getting the horse from the field, leading the horse, saddling the horse
Riding	Riding/leading the horse in the forest or an arena
Grooming	Grooming the horse
Stablework	Mucking out, feeding horses
Contact with other animals	Mucking out, feeding other animals
Other horse-related	Getting tack from the tackroom, cleaning up, walking to get to the field
Other not horse- related	Talking to each other or playing while waiting
No activity	Inactive while waiting
Physical contact (petting)	The adolescent initiating petting the horse
Verbal contact	The adolescent talking to the head of the horse
Eye contact	The adolescent looking at the head of the horse
Positive response from the horse	The horse turning its head toward the adolescent and/or tilting its ears forward
No response from the horse	The horse standing still and having its ears relaxed to the side
Negative response from the horse	The horse turning its head toward the adolescent and/or tilting its ears backwards
Not able to solve the task	The adolescent having problems with the task presented due to the horse or the adolescent not understanding what to do
Trying again	The adolescent trying again when not being able to solve the task
Not trying again	The adolescent not trying again when not being able to solve the task

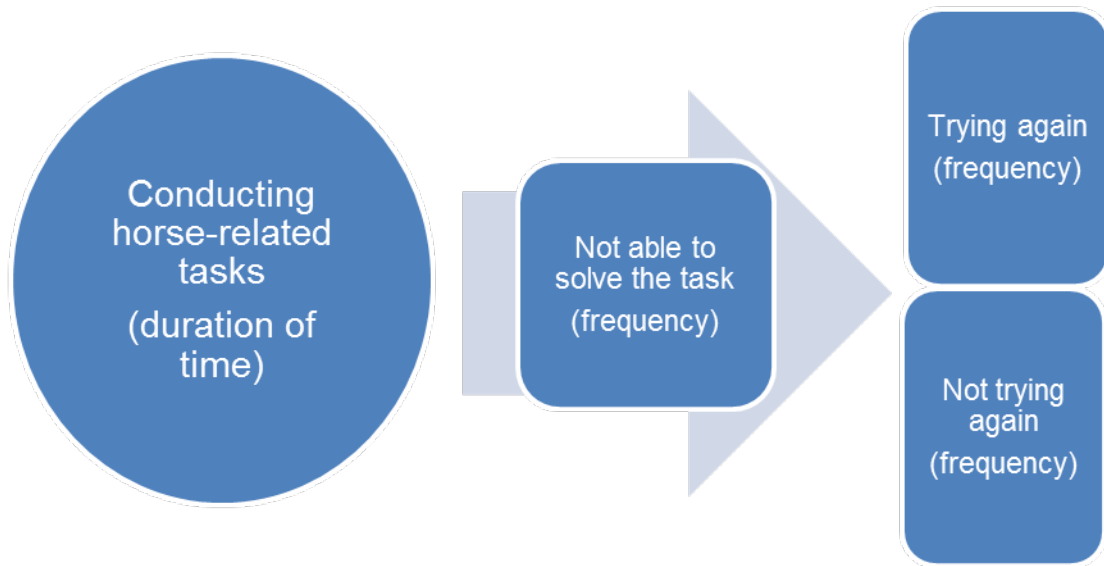


Figure 1. Explanation of the different behavioral categories used in the analysis. Conducting of horse-related tasks analyzed as duration of time, not able to solve the horse-related task, and the following selection of strategy in frequency per hour.

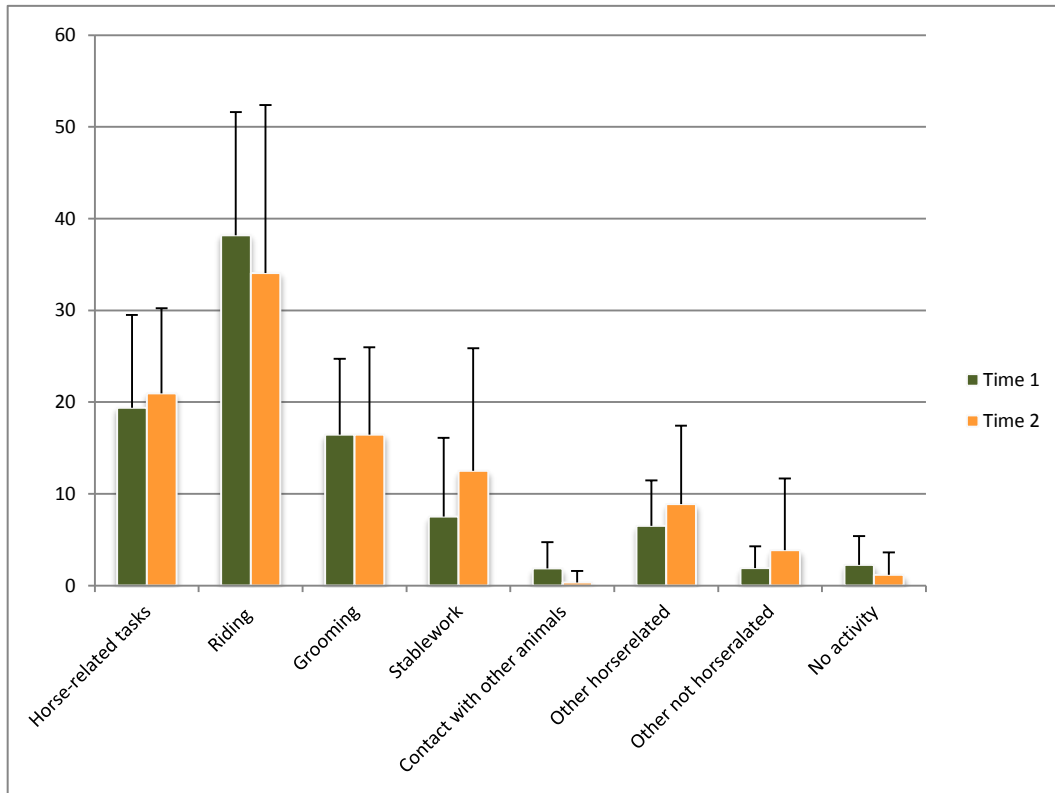


Figure 2. Time budget of activities on the farm early and late during the intervention, percentages of time recorded (*Mean + SD*).

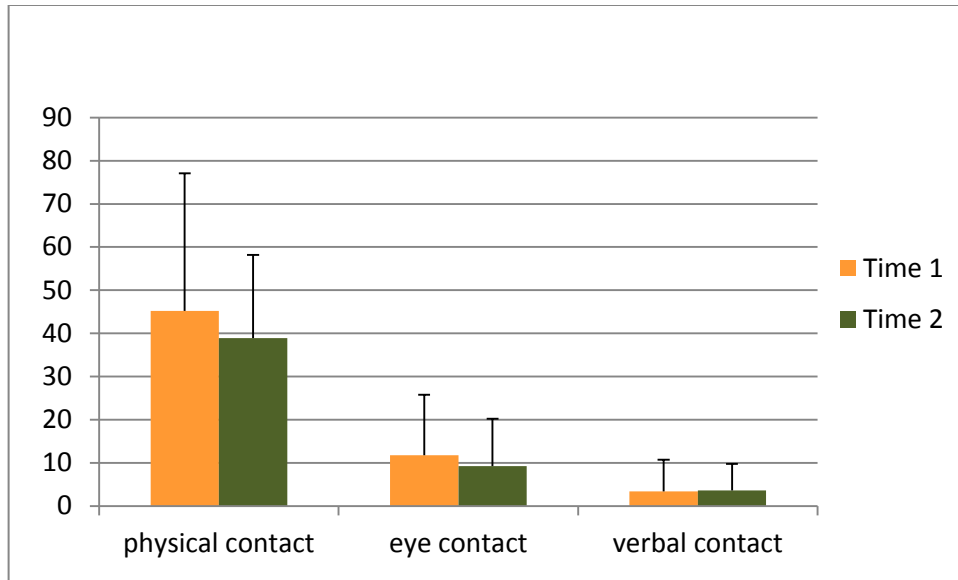


Figure 3. Frequency per hour of different types of contacts the adolescents initiated with the horse, based on time used on grooming and tasks with the horse (*Mean + SD*).

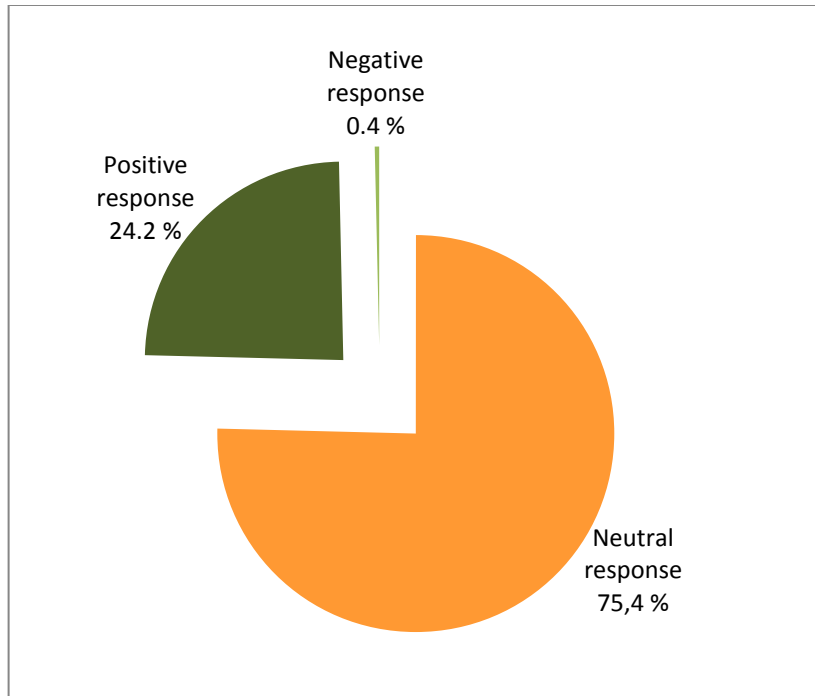


Figure 4. Response from the horse to the contact initiated by the adolescents, presented as percentage distribution of frequencies per hour for early and late recordings combined.

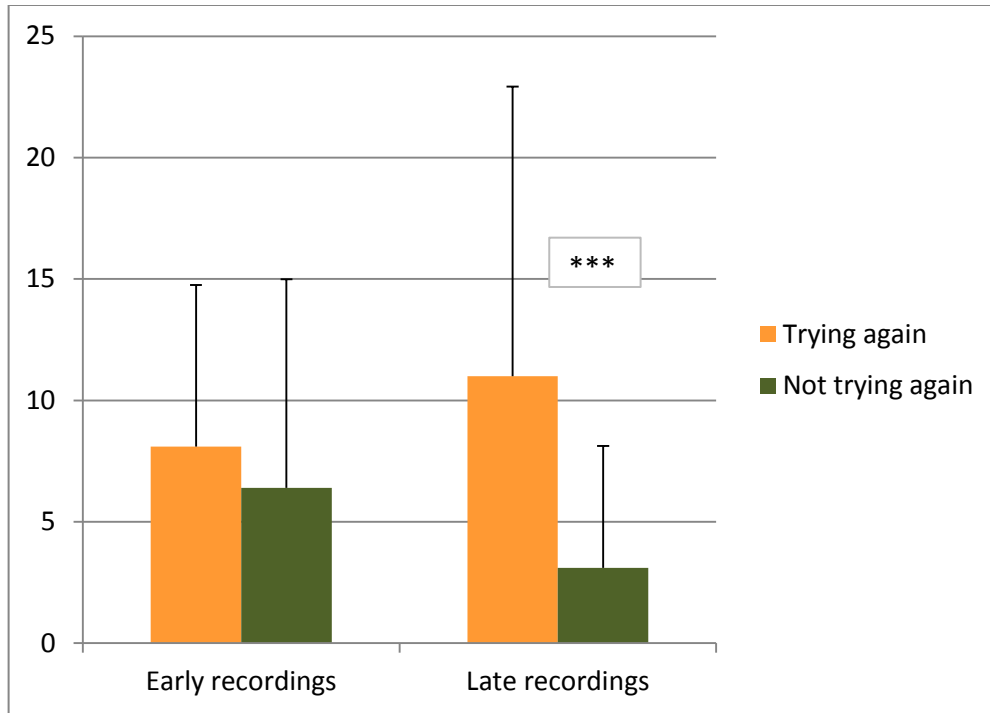


Figure 5. Choice of strategy when not being able to solve the task, presented as frequencies per hour of trying again and not trying again during early and late recordings (Mean + SD).