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The Effect of Hay Net Use on Cribbing Horses

Lauren Wesolowski
lauren.wesolowski@otterbein.edu

THE EFFECT OF HAY NET USE ON CRIBBING HORSES

by

Lauren Wesolowski
Department of Equine Science
Otterbein University
Westerville, Ohio 43081

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Steffanie Burk	
Honors Advisor (Please print name)	Advisor's Signature
Anna Young	
Second Reader (Please print name)	Second Reader's Signature
Halard Lescinsky	
Honors Representative (Please print name)	Honors Rep's Signature

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Abstract

Cribbing is a stereotypic behavior observed in horses, wherein the animal grasps a solid object with its front incisors and contracts its neck muscles to suck in air through its mouth, resulting in an audible grunt. Stereotypic behaviors such as cribbing are thought to be done in response to stress or insufficient stimulus in an animal's living environment. Slow feeding hay nets can increase the amount of time horses spend eating daily hay rations. This research aims to use slow feeding hay nets to create a feeding process that is closer to natural grazing behavior and provide more stimulation for stabled horses. This could cause a change in the cribbing frequency of horses who are established cribbers. The study objective was to determine if cribbing horses fed out of slow feeding hay nets have a significant change in cribbing frequency or duration. This study included 10 cribbing horses and followed a cross-over design where horses ate out of a hay net for one week and ate hay on the ground for one week. At the end of each week, horses were observed and the number of cribs, cribbing time, and hay eating time were recorded. The results from paired t-tests and Wilcoxon signed-ranks tests showed no significant difference in number of cribs ($p=0.85$), the cribbing time ($p=0.96$) or eating time ($p=0.89$). Although no significant change in behavior was observed from this study, alternative research has shown there are other management techniques that could be effective in reducing the frequency of cribbing.

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Introduction

Stereotypic behavior

A stereotypic behavior or stereotypy is considered a repetitive, self-stimulatory body motion that does not have any known purpose (Mason, 1991). Cribbing is a well-known stereotypy that exists in horses. Stereotypies, including cribbing, are thought to be associated with situations that are stressful, situations where animals are confined for extended time, or situations where the animal is unable to perform a behavior that it is highly motivated to do, like feeding behavior (Mason, 1991; Houpt & McDonnell, 1993).

Negative Effects of Cribbing

The pressure exerted on various surfaces by the cribbing motion can cause damage to fences, buckets, and stall walls (Camargo, 2014; Houpt, 1986). The potential to cause damage to the property can cause issues for current owners and can make cribbing horses less desirable in the eyes of future buyers. Cribbing can also lead to health complications in the horse. The crib biting behavior is likely to cause damage to the horse's teeth. Specifically, cribbing can result in excessive wear on the incisor arcade, which may cause further issues like hindering the horse's ability to graze or contributing to the development of dental disease (Lowder & Mueller, 1998; Boyd, 1986). Along with dental problems, some studies have found that cribbing is associated with colic (Malamed et al., 2010). Cribbing behavior was found to be strongly associated with increased risk of epiploic entrapment, which is a specific kind of colic involving the entrapment of intestine in the epiploic foramen (Archer, Pinchbeck, French, & Proudman, 2008). As well as epiploic entrapment, cribbing is also associated with an increased risk of simple colonic obstruction and distention (Hillyer et al. 2002). It is important to study ways to prevent or reduce

cribbing in order to improve the welfare of horses who crib and reduce their risk of colic and dental issues.

Cribbing Treatments and Management

Researchers have long been interested in studying treatments and management techniques for cribbing. Specifically, the relationship between cribbing and feeding of grain has been investigated. Feeding a larger quantity of concentrated grain is associated with increased cribbing frequency (Ruet et al., 2019). Horses also spend more time cribbing when fed a sweetened grain diet than when fed oats (Whisher et al., 2011). Horses fed highly palatable grain exhibit increased frequency of cribbing (Albright, Sun & Houpt, 2017). Additionally, a reduction in cribbing is seen when a feeding dispenser is used for the provision of daily grain (Mazzola et al., 2016). This dispenser, named Quaryka, can be spun by the horse's nose or mouth to release small amounts of grain, and it was shown to be able to increase the time that the horses take to finish eating their concentrate meals. Cribbing time can be also reduced by providing horses with a specific toy (Whisher et al., 2011). The only toy found to reduce cribbing is a spinning sweet toy (Tongue Twister) with a sugar gelatin mixture inside. These methods are helpful in managing some horses, but they only reduced the cribbing and did not solve the problem completely. Cribbing collars or straps (figure 1) are a commonly used method to reduce high frequency or duration of cribbing, but they have not shown to be effective for every horse and a cribbing collar leads to an increased cribbing frequency during any period in which the collar is taken off (McGreevy & Nicol, 2010). Cribbing collars have also shown to be associated with elevated plasma cortisol levels and elevated stress levels (McBride & Cuddeford, 2001; Nagy et al., 2009). One possible treatment to cribbing that has been investigated is a modified Forssell's

surgery. Several procedures have been conducted where an Nd:YAG or CO_2 laser was used to complete a rostral transection of the sternohyoideus and omohyoideus muscles (DelaCalle et. al, 2001). The results showed 84.4% success rate in one study and 100% success rate in another study (Baia et al., 2015; DelaCalle et al., 2001). Although these results are promising, it is important to continue to study less invasive solutions for horse owners who may not be interested in surgical options.

Importance of Foraging and Effect of Hay Nets

Domestic horses, when given access, spend 10-17 hours of their day grazing (Bott et al., 2013). Many equine facilities do not have the desire to or are not capable of providing their stabled horses with such a substantial amount of grazing time. Specifically, in poor weather conditions or on farms with insufficient acreage, grazing and time outside is limited for most horses. An alternative option to slow down the horse's hay intake and extend the amount of time spent eating their given hay is to employ a slow feeding hay net (figure 2). Slow feeding hay nets have small enough holes to cause the horse to spend an increased amount of time eating the hay when compared to feeding hay on the ground (Glunk, et al., 2014, Morgan et al., 2016). Additionally, the cribbing frequency of horses was found to decrease an hour before feeding hay on the ground and remain low for 75 minutes after receiving it (Kusunose, 1992). A hay net could be used to extend this observed decreased cribbing frequency by allowing them to continue to eat their hay for a longer time period. This study aims to examine the possible association between time spent foraging and cribbing behavior. Use of hay nets was associated with increased frustration behaviors when compared to the use of hay slow feeders on the ground (Rochais, Henry, & Hausberger, 2017). Despite this previous finding, this study used hay nets to

get a better understanding of the effect of hay nets on cribbing behavior specifically. Additionally, hay nets were the more affordable option and within the constraints of the budget. The hypothesis of this study was that fast foraging and completion of hay causes a high frequency of cribbing. The prediction of this study was that the use of slow feeding hay nets will reduce the frequency and duration of cribbing.

Methodology

This study follows a cross-over design. It included two groups (1 and 2) with a total of 10 established cribbing horses overall, or 5 in each group. Treatment Net (N) consisted of the horses being fed their daily hay ration out of a slow-feeder hay net with an approximate hole size of 1 x 1 inch. The control consisted of the horses being fed their daily hay on the ground without a net. Group 1 was assigned treatment N for one week while group 2 was assigned control for one week. This was followed by switching so group 1 completed a week of control and group 2 completed a week of treatment N. At the end of each week, horses were observed for two days in a row. Both groups were observed for 25 minutes either in the morning or evening after each horse received and finished eating a regular serving of grain. Each horse was watched at a specific time and was always watched at that same time during every observation period. Data were recorded as number of cribs, time spent eating hay and time spent cribbing. The time spent eating hay and time spent cribbing were recorded using two stopwatches. The stopwatch for the hay eating time was started when the observed horse moved their lips or teeth to grab a piece of hay. It was paused every time the horse turned its head or body away from the hay. The stopwatch for the cribbing time was started when the horse's teeth first touched a solid object and was paused every time the horse turned its head or body away from the object. The time budget from each week was used to show whether the equine subject spent more, less or the same amount of time cribbing.

The quantitative data of number of cribbing attempts, cribbing time and eating time were analyzed through a paired t-test or Wilcoxon signed-ranks test to determine if there is a statistical difference in mean number of crib bites and mean amount of time spent cribbing ($p<0.05$) for each treatment. Shapiro-Wilk tests were first run to check for normality. Data sets that resulted in

$p<0.05$ were not normally distributed so Wilcoxon signed-ranks tests were then used for the data that had values of $p<0.05$ for the Shapiro-Wilk test. A paired t-test was used for each data set which had a value of $p>0.05$ in the Shapiro-Wilk test.

The horses used in the study are from various barns in central Ohio. Data were collected in January and February where temperatures ranged between 10° and 50° Fahrenheit. The horses had variable turnout and feed schedules as well as differing diets. In addition to this, some horses wore a cribbing collar on a regular basis while others did not (table 4). However, whether each horse wore a cribbing collar or not remained consistent for each horse throughout the entire study. Half the sample consisted of working horses that were ridden on a daily basis in a university school horse lesson program. The other half of the sample is made of horses with variable workloads. Horses received grain and hay two or three times a day. Each of horse spent most of the day in a stall with approximately 1 hour to 10 hours of time turned outside in a field with access to grass or in a paddock with access to more hay.

Results

The results of the t-tests showed no significant difference ($t(9)=0.192$, $p=0.85$) between the mean cribs of the horses during treatment N and the mean cribs during the control week (table 1, figure 3). Additionally, the overall mean minutes spent cribbing during treatment N compared to overall mean minutes spent cribbing during control showed no significant difference ($t(9)= -0.053$, $p=0.96$) (table 2). Also, the overall mean time spent eating hay was not significantly different ($t(9)= -0.145$, $p=0.89$) between the two weeks (table 3). The results of the Wilcoxon signed-ranks test revealed only a significant difference ($p=0.043$) in the number of cribs on the first observation day of treatment N when compared to the number of cribs on the second observation day of treatment N (figure 4). The mean number of cribs was significantly lower on day 2 of observation. Correspondingly, there was also a significant difference ($p=0.043$) in the minutes spent cribbing on day one of observation for treatment N when compared to day two observation of treatment N.

Discussion

The outcome of this study supports the conclusion that small hole hay nets are not a management method to reduce cribbing frequency or duration immediately after a concentrate meal. Horse trainers, owners, and managers may want to look elsewhere for a management practice that may be more effective in reducing cribbing. When comparing hay nets hung on the wall with a hay slow feeder on the ground, the slow feeder was found to reduce stereotypic behaviors while hay nets were associated with increased frustration behaviors (Rochais, Henry, & Hausberger, 2017). These hay slow feeders on the ground show potential for a more beneficial impact on cribbing and horse behavior than traditional hanging hay nets. As well as slow feeders for hay, feed dispensers for the horse's grain have also been shown to be effective in reducing cribbing frequency (Mazzola et al., 2016).

Additionally, it is possible that other methods of stimulation could be beneficial and reduce the number of cribs per horse. Stimulation such as a toy or stall windows have shown to reduce unwanted behaviors such as stereotypies or aggression (Whisher et al., 2011; Ruet et al. 2019). All of these methods have demonstrated effectiveness in reduction of cribbing frequency and duration. Therefore, owners should turn to one of the aforementioned management practices instead of slow feeding hay nets when looking to reduce cribbing.

This study attempted to control as many variables within the horse management as possible to ensure conditions remained the same throughout the study and consistent results were recorded. However, there were many limitations which made absolute consistency difficult to achieve. Variables such as different housing locations, feeding practices, training regimens and turnout schedules were unable to be controlled for study purposes and may have contributed to the fluctuations in cribbing rates. The use of a cross over study design was intended to mitigate

the potentially influential factors which differed per horse. Additionally, the hay nets used were ripped and stretched by the horses throughout the duration of the treatments. Although the nets originally had holes of 1 x 1 inch, the nets at the conclusion of the study had holes varying from 0.75 inches to 2 inches with an overall average size of 1.41 x 1.35 holes. Some horses may have been using a net with slightly larger holes for a large portion of the study which could have influenced their ability to eat the hay and their cribbing behavior.

The significant difference between cribs on day one versus day two of treatment N (figure 4) could potentially be due the slight variation in feeding time between the days. The horses were watched at the same time each day, but the exact time each horse was fed was not monitored and varied by 1-5 minutes.

In addition to this, another potential factor that could have influenced the significant change in cribs from day one to day two of treatment N was the short period of time that the horses were observed. Extension of the observation period to an hour or a few hours may have presented a more accurate representation of the typical amount of crib-bites per horse after being fed their concentrate. Horses fed out of hay nets with 1.25-1.75-inch holes take 2-3.5 hours longer to finish eating a serving of hay (Glunk et al., 2014). A longer observation period would have allowed for a broader view of how the cribbing frequency and duration is impacted by the extended time spent finishing the hay serving. The observation period for only 25 minutes shortly after they received a hay ration did not capture exactly what this study was intended to examine. The results were not able to show what the cribbing frequencies were later in the day when the horses using a hay net were still eating hay while the horses eating hay on the ground had likely finished the hay ration. A comparison of the cribbing behavior for a longer time period may have shown a more significant difference between hay nets and ground feeding. Future

research should be done to provide a better examination of the total effect of hay nets on cribbing.

Research has shown that concentrated feed can cause increased cribbing frequency (Albright, Sun & Houpt, 2017; Ruet et al., 2019). This was a possible influence on the different cribbing rates of the horses used in this study. Each horse received a different type and amount of concentrate (table 4) which could contribute to the great variation in individual cribbing frequencies among the different horses. However, the concentrate that each individual horse received remained the same throughout the duration of the study. When testing the effect of several environmental changes such as provision of toys, variation in exercise, and changes in the grain diets of the horses, results suggest that concentrated grain is the most influential factor on cribbing frequency and duration (Whisher et al., 2011). Additionally, other research has found that crib-biting horses have lower levels of selenium than non-cribbing horses, and their selenium levels decrease during the cribbing behavior (Omidi, Jafari, Nazifi & Parker, 2018). More research is needed to investigate the significance of these findings. However, this could have potentially played a role in the cribbing variance observed within this study as well.

Conclusion

No significant difference in the number of cribs or cribbing time was found in this study. Owners should potentially look to other management methods besides small hole hay nets to reduce cribbing immediately following completion of a concentrate meal. However, the lack of significant results may be partially attributed to small sample size, the short observation periods, or the variation in horse management practices among the individual horses. Further research is needed to determine if observation of cribbing for a longer time period would reveal a significant difference between cribbing while using a hay net and cribbing while eating hay on the ground. Additionally, further research should be done to determine if the use of other methods to extend eating time or increased stimuli could reduce the amount of cribbing in horses.

Appendix A: Tables

Table 1. The mean number of times each horse cribbed during the 25-minute observation periods while eating from a hay net (Treatment N) and while eating hay on the ground (Control).

Subject #	Treatment N Crib-bites	Control Crib-bites
Horse 1	122.5	57
Horse 2	0	0
Horse 3	57.5	53
Horse 4	0	20
Horse 5	77	40
Horse 6	0	0
Horse 7	26.5	25.5
Horse 8	73.5	49
Horse 9	0	74
Horse 10	6	22

Table 2. The mean time each horse spent cribbing during the 25-minute observation periods while eating from a hay net (Treatment N) and while eating hay on the ground (Control).

Subject #	Treatment N Cribbing Time (minutes)	Control Cribbing Time (minutes)
Horse 1	10.35	5.13
Horse 2	0	0
Horse 3	5.32	4.85
Horse 4	0	2.18
Horse 5	5.57	2.76
Horse 6	0	0
Horse 7	2.28	2.15
Horse 8	4.06	3.03
Horse 9	0	7.00
Horse 10	0.42	1.43

Table 3. The mean time each horse spent eating hay during the 25-minute observation periods while eating from a hay net (Treatment N) and while eating hay on the ground (Control).

Subject #	Treatment N Eating Time (minutes)	Control Eating Time (minutes)
Horse 1	3.02	11.78
Horse 2	19.67	22.18
Horse 3	15.55	17.52
Horse 4	23.77	20.50
Horse 5	10.90	15.29
Horse 6	24.18	14.27
Horse 7	19.77	19.20
Horse 8	0.81	13.56
Horse 9	21.73	14.47
Horse 10	17.98	11.91

Table 4. Recorded management practices per horse during the time the treatments occurred.

Subject #	Sex	Type of Grain	Amount per meal	Times fed per day	Supplements	Turnout time per day	Cribbing Collar (Yes/No)
Horse 1	Gelding	Purina Senior	4lbs	2	Amplify	1-4 hours	Yes
Horse 2	Gelding	Purina Senior + Ultium	3lbs + 1 ½ lbs	2	Isoxsuprine	10 hours	Yes
Horse 3	Mare	Purina Ultium	4lbs	2	None	1-4 hours	Yes
Horse 4	Gelding	Purina Ultium	3lbs	2	Equioxx tablet	1-4 hours	No
Horse 5	Gelding	Purina Ultium	3 ½lbs	2	None	1-4 hours	No
Horse 6	Mare	Nutrina Proforce fuel	1-2lbs	2	None	1-2 hours	Yes
Horse 7	Gelding	Tribute Ultra	1lb	2	Relyne GI	2-3 hours	No
Horse 8	Gelding	Tribute Essential K	1lb	2	Elevate maintenance powder, Outlast gastric support, Equithrive joint pellets	8-10 hours	No
Horse 9	Mare	Senior	1lb	3	Beet pulp	2-12 hours	No
Horse 10	Gelding	n/a	1lb	2	None	2-12 hours	No

Appendix B: Figures

Figure 1. A type of cribbing collar worn by some of the horses in the study.

Figure 2. A small hole hay net which was used for feeding horses with a hay net (Treatment N) in the study.

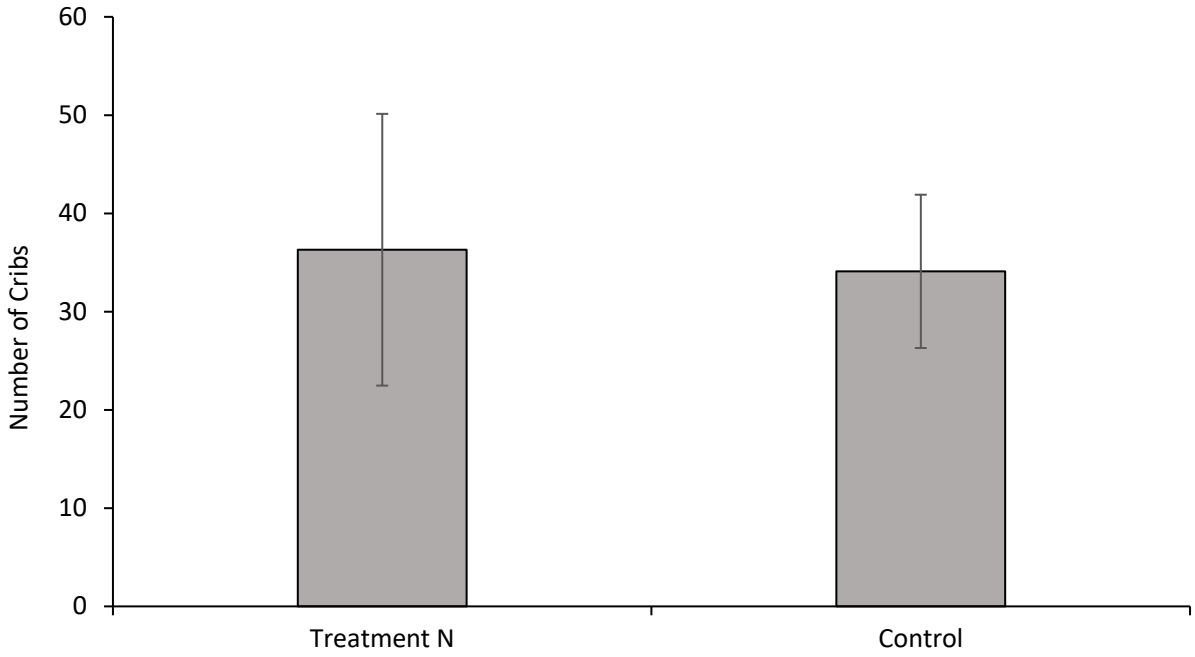

Figure 3. The mean and standard error of the number of crib-bites observed while using a hay net (Treatment N) and while eating hay on the ground (Control).

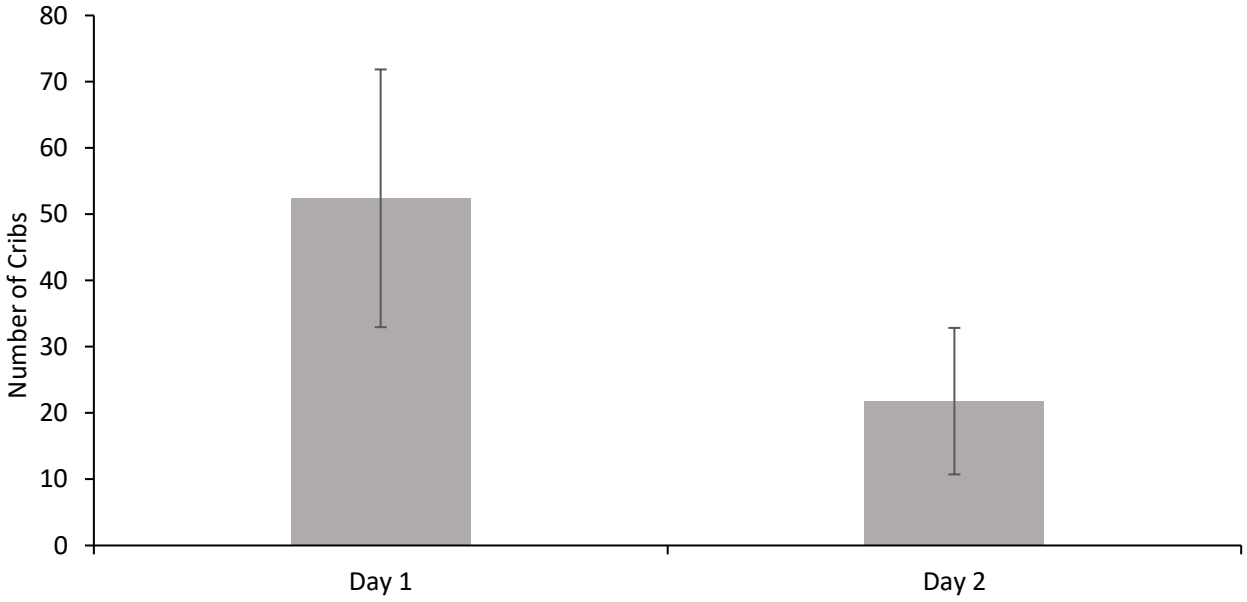

Figure 4. The mean and standard error of the number of crib-bites on the first day of observation and the second day of observation while feeding with a hay net (Treatment N).

Appendix C: Animal Care and Use

Animal Care and Use Committee Approval Form

Date of Approval: 1/16/19

Participant: Lauren Wesolowski

Faculty: Dr. Steffanie Burk

Project Title: The Effect of Hay Net Use on Cribbing

Approved By: Animal Care and Use Committee 2018-2019

Committee Chair: Dr. Sheri Birmingham

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