Weight Gain and Feeding Strategies Affect Voluntary Physical Activity in Cats

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Abstract
Over half of the feline pet population in the U.S. is overweight or obese. Increased physical activity has been a common approach to manage this condition. Multiple feeding strategies have been suggested to aid in stimulating physical activity of domestic cats, but little scientific evidence has been published. This presentation will provide a brief summary of recent experiments performed in our laboratory evaluating the effects of weight gain and feeding strategies on the voluntary physical activity of domestic cats.

Glossary of Abbreviations
BCS: Body Condition Score
BW: Body Weight
DEXA: Dual-Energy X-Ray Absorptiometry
FAA: Food Anticipatory Activity

Introduction
Feline obesity is an epidemic problem in the U.S. that afflicts over 58% of the domestic feline pet population.[1] The estimated average percent body fat of domestic cats having an ideal body weight (BW) and body condition score (BCS) varies from approximately 20 to 30%, whereas overweight and obese cats have, on average, body fat mass greater than 35%.[2,3] Common strategies to curb obesity are dietary management (e.g., calorie restriction) and environmental enrichment (e.g., increased physical activity). Anecdotally, feeding multiple small meals daily has been a general recommendation by veterinarians to pet owners as an effective strategy to increase physical activity and assist in the management or prevention of body weight gain.[4] However, little scientific evidence about the effect of feeding strategy in increasing physical activity currently is available.[6,7]

Effect of Weight Gain on Voluntary Physical Activity in Cats
A recent study in our laboratory evaluated the effects of *ad libitum* feeding on BW, BCS and physical activity in adult domestic cats.[5] In this study, nine neutered domestic shorthair male cats (mean age = 8 ± 0.3 yr; mean BW = 4.5 ± 0.4 kg; mean BCS range = 5.0 ± 0.5) were *ad libitum* fed for 36 weeks Food intake was measured daily, while BW and BCS were measured weekly. Voluntary physical activity was measured using Actical accelerometers, and dual-energy X-ray absorptiometry (DEXA) scans were conducted at 0, 6, 12, 24, and 36 weeks *Ad libitum* feeding resulted in a dramatic increase ($p<0.05$) in food intake (128% by 6 wk) and remained significantly higher throughout the study. Cats incrementally changed from a lean phenotype (mean BCS = 5.0) at baseline to an overweight phenotype with a mean BCS of 7.5 at 36 weeks. DEXA scans indicated that mean percent fat mass increased ($p<0.05$) from 10.4% at baseline to 35.0% and 37.as required to resist cookies have on subsequent self-control efforts?
The findings were quite striking. In the next part of the study, participants were given a series of tracing puzzles and told that they could take as much time and have as many attempts to solve them as they wished. In fact, the puzzles were impossible to solve and the real purpose of this task was to see how long participants kept trying before giving up (the idea being that persistence requires self-control becausen recommended over a single-meal feeding to aid in the maintenance of ideal BW.[4] A recent study in our laboratory evaluated the voluntary physical activity among male neutered cats fed one, two, four, or a random number of meals per day in a 4 × 4 Latin square design. The average daily activity level for cats fed one-meal daily was lower ($p<0.05$) than the four-meal-fed and random-meal-fed cats (13.8, 16.6 and 16.1 activity counts/epoch, respectively). The activity level of cats during the dark period was greater in one-meal-fed cats compared with cats fed two meals ($p<0.05$) or four meals ($p<0.05$) daily. The food anticipatory activity (FAA) prior to scheduled meal times for one-meal-fed cats was lower ($p<0.0001$) than the multiple-meal-fed cats. However, cats fed only one meal (0800 feeding time) had higher FAA than those fed multiple meals daily before the morning meal.[6]

Another study in our laboratory investigated whether increased feeding frequency (one versus four meals daily) in conjunction with dietary water content (12 versus 70% moisture) increased voluntary physical activity of young lean adult

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female cats. A replicated 4 x 4 Latin square design with a 2 x 2 factorial treatment arrangement (feeding frequency and water content) was used.[7] While dietary water content did not affect voluntary physical activity, increased feeding frequency resulted in greater average daily activity ($p<0.05$), activity during the light period ($p<0.05$) and light:dark activity ratio ($p<0.05$). Cats fed four meals had greater afternoon FAA ($p<0.05$) compared with cats fed once daily. This is in contrast with previous findings from our laboratory.[6] The discrepancies in the FAA findings between these studies could be related to the lower (~25%) amount of food and energy per kg BW required by the neutered male cats, which could have led to a greater feeling of hunger, or search for food may have occurred in those animals in contrast to intact female cats.[7] Deng, et al.,[6] observed that FAA contributed to 51 to 61% of the total daily activity, whereas FAA only represented 35% of the total daily activity in intact female cats.[7]

Conclusions

As hypothesized, *ad libitum* feeding led to BW gain in domestic cats. Daily voluntary physical activity tended to decrease with weight gain, favoring positive energy balance in these animals. In addition, according to the data from two studies fic on the commute home) may hamper efforts to feed appropriately. In short, even if owners identify the need to limit the amount of food they provide their animal and strive to monitor intake, they may lack the resources needed to translate these good intentions into action.

Potential Solutions and Future Directions

Fortunately, it is not all bad news. Using a self-regulatory framework to understand the challenges that owners of companion animals likely face in regulat successfully.

References

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Self-affirma*tion tackles the problem* that it may be difficult for owners to accept that their companion animal is overweight, as it likely reflects badly on them as *owners (*e.g., it suggests that they have not been feeding or exercising the animal appropriately). Self-enhancement theorists sugges*t that such defensive responses are the result of efforts to proth Symposium*. 2014:17-18.

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