**Discussion**

**Intrinsic Factors:**

Discuss the effects of intrinsic factors such as sex, maturity, satiation, and body mass on sentinel behavior.

Males sentineled more. More energy to be invested in sentinel behaviour, but also sentinel behaviour could be used for other reasons

Territory guarding

Keeping tabs on group members and the presence of other groups

alright so we identified a couple of different trends in our review and then we separated them as either intrinsic factors so factors that come from within or extrinsic factor stuff that comes from the outside so environmental factors and stuff like that I when it came to the intrinsic factors we found that sex maturity satiation and body mass all had effects on central behavior across mammal an avian species um sex for example was the trend that we largely observed during when we saw sex being the the effect tested was that males would central more more often for longer an earlier than females yeah this could be explained through bedrock of state dependent model as males having generally speaking more energy to be invested in stuff outside of reproduction egg laying clutching and female reproduction the female reproductive energy investment is much higher than in males which could essentially be interpreted as them not having as much energy to allocate to central behavior their energetic threshold that theoretical limit is potentially much higher in females than in males which explains why males central more now this could also be for reasons outside of energetic reserves but also the differential use of the Sentinels post for information gathering now yes they do pay attention to outside search sources of threat so the anti predatory troll but it could also be a good post for territory guarding and information collection about other individuals in the group as well as the presence of other groups around it so this little tiny internal something else but I'll get to that when we get to that but this kind of like introduces the idea that central behavior is not an exclusively anti predatory behavior but might serve might play a role in a number of other behaviors as well which is pretty cool another intrinsic

Heavier and satiated individuals sentineled more. Again, consistent with Bedneckoff’s model, could be due to having more energy to sentinel. Unfed individuals in experiments decreased their sentinel contribution (compensation). Factor

another intrinsic factor that we saw had an effect was heavy and satiated individuals sentence Ling for longer now again this can be this is consistent with Ben acavs model where have your individuals have greater energetic reserves and therefore will be more able or more prone to performing central behavior than other individuals now the cool aspect of this is that when doing satiation experiments researchers found that unfed individuals would compensate for the satiated individuals Sentinel behavior by diminishing their own central contributions So what century that means is that there is some form of communication or coordination of Sentinel behavior so that end up being said then lighter individuals did it too few comparatively few studies that have looked at the effects of body mass and satiation for the simple reason that these experiments are much harder to conduct an observation ull studies body mass experiments for example you would need to train an individual to stand on a weighted plate to get their initial mass then while they're eating eat the food and then weigh them again and then you'd have to make sure we're at least be lucky enough that the individuals then go and immediately perform centre behavior as opposed to just \*\*\*\*\*\*\* off and cool but Nicholas model again if I need to really explain that ascentia Lee Bender cause model which state that individuals that have the energetic reserves to be able to Sentinel will choose to Sentinel if the alternative is forging without asentinel because it is considerably safer for the Sentinel itself for the individual that chooses to become Sentinel did the cool

Mention experiments and how difficult they are to conduct (especially body mass)

Explain Bedneckoff’s model again

More mature, older individuals sentineled more than younger individuals.

The last intrinsic effect that we saw across all across avian and mammal species was the effects of age you had more mature older individuals sentence elling a lot longer than less mature younger individuals and most specifically juveniles um this could be a result of experience so older individuals have a greater breadth of experiences from which to draw on to figure out whether something is or isn't threatening you wouldn't necessarily want to have a young individual who would not know if something is a threat to be Sentinel because a they might not call make an alarm call in the presence of a sense of a threat or possibly just as bad make alarm calls when there are no threats present so that really does sort of point towards the idea that asentinel must be a good centinal to be effective and must know when to call an alarm call because alarm calls essentially cause all individuals to adopt A heightened vigilance state stop forging which if there is no proper stimulus for this if this is something that was done erroneously this is incredibly unfit because now you're losing time foraging you're spending energy to actually fly away so it's hugely negative affect if the Sentinel doesn't know when and where to call for alarm calls the other thing is that teaching social learning might also play a role where the alarm calls of older individuals will essentially teach the younger will teach the younger individuals in a more safe manner than through you know direct experience whether something is or isn't a threat by that I mean if a young individuals forging and sees let's say a dog uh they may or may not call well they will be highly intolerant to list she better example would be human alarm call might get triggered if the human gets too close to the forgers but what is or isn't close enough might be dictated by the experience of the older individuals who are sentence so yes there is that individual vigilance that plays role that individual tolerance or that individual personality whether an individual is more neophobic or new filak so that is going to play a role in that but you're also going to have outside that outside presence that is going to trigger alarm call when that gets close when that threat actually realizes another kind of \*\*\*\* explanation but whatever now obviously because in and

More experience with threats, younger individuals might not know what is or isn’t threatening, making them less effective sentinels

Older individual could be teaching younger individuals about threats by sentineling and making alarm calls when threats are present.

Older individuals could also be heavier and forage more effectively, making sentinel behaviour in young individuals unfit

lastly because everything needs to tie into bedrock of state dependent model because it's nicer that way older individuals could also be heavier or forged more effectively than younger individuals so that could also play a part in older individuals having higher energetic reserves than younger individuals who might forage less effectively who might not know where is the optimal locations and methods to forge on things so that could make Sentinel behavior in younger individuals less fit because it is driving or that because of insufficient energetic reserves causing the last forging opportunity costs to be greater in younger individuals than in older individuals.

Interpret the observed trends and their implications for understanding sentinel behavior.

Intrinsic factors appear mostly related to energetic reserves and the ability to perform sentinel behaviour without incurring risks of starvation.

The kind of summarize everything intrinsic factors appear mostly related to energetic reserves then the ability to actually perform Sentinel behavior with oh and the ability to perform central behavior without the incurring risks of starvation rather than any sort of altruistic external benefits provided to another individual so this really does support bendick off state dependent model for selfish central behavior where the primary beneficiary of central behavior is that the individual performing system of behavior with indirect benefits imparted onto the foragers

Also introduces sentinel behaviour as not only an antipredatory strategy, but also serves other purposes to \*some\* individuals.

This is even more sort of helped by the idea the hypothesis that central behavior does share different functions does help with different other behaviors namely territory defence and information gathering so it's clearly not of altruistic vigilant behavior by nature but instead much more of a selfish self-serving behavior that just happens to benefit other group members.

OK that was a lot to say very little go ask me questions

**Extrinsic Factors:**

Analyze the effects of extrinsic factors such as dominance, group size, and risk on sentinel behavior.

More dominant individuals sentineled more than subordinates, Possibly more energy to sentinel or ability to forage more effectively (bullying others, receiving gifts, etc).

Also ties into other purposes for sentinel behaviour that would serve dominant individuals more

Sex / Dominance interaction also supports this hypothesis, with dominant males sentineling more. Could be that dominant males need to keep track of other groups and group members.

Could be explained through Bedneckoff’s model again

Group size led to a decrease in individual sentinel behaviour, but greater sentinel behaviour at the group level.

More individuals capable of sentineling, therefore shorter and less frequent bouts for all individuals.

Safety in numbers, more individuals capable of being vigilant.

Risk increased sentinel behaviour

Makes sense, more need for vigilance = more sentinel behaviour

This can be either the presence of young or the presence of predator

Sentinel more when other group rivals were sensed, fitting with the hypothesis that sentinel behaviour serves other purposes other than antipredator vigilance.

Discuss how social dynamics and environmental factors influence sentinel decision-making.

Group size and dominance, the two social factors, appear to still be in relation to energetic levels. Dominance can be argued to also have the added motivation of information gathering and territory defense.

Risk can be explained through Bedneckoff’s model as a selfish decision to maintain personal safety first, rather than an altruistic behaviour that primarily benefits other individuals.

Outgroup rivals falls into this as it is a selfish decision to be sentinel after being exposed to stimuli from outgroup rivals, especially dominant individuals.

Risk to all individuals. Assumptions of Bedneckoff’s model state that between sentinel and foraging without a sentinel, sentinel is safer.

**Coordination in Sentinel Behavior:**

Evaluate the presence of coordination as a characteristic element of sentinel behavior in the studies analyzed.

Discuss any trends or changes observed over time regarding the inclusion of coordination in defining sentinel behavior.

**Exploration of Urbanization Effects:**

Why urbanization but not climate change or invasive species.

Explore the potential effects of urbanization on sentinel behavior using the factors identified in the review.

Examine the various factors associated with urban environments that may influence sentinel behavior, such as habitat alteration, noise pollution, and human presence.

**Identification of Research Gaps:**

Identify gaps and areas of uncertainty within the existing literature on urbanization and sentinel behavior.

Very few articles empirically testing the effects of satiation and body mass on sentinel behaviour

Very likely due to how difficult it is to train animals to stand on a scale, for example.

Few articles on the various effects of urbanization on sentinel behaviours.

Completely different environment, different factors involved.

An extensive research endeavour would be required to effectively parse through the effects of urbanization on sentinel behaviour

Few species used in experiments, could use different species to see if there are great deviations caused by species type.

Do different species have a different sentinel system?

**Implications and Future Directions:**

Discuss the implications of the findings for understanding animal behavior and ecology.

More research is beneficial to truly discern the underlying mechanisms behind sentinel behaviour and social behaviours as a whole

Would help us better understand how these behaviours evolved, and how they might continue to change

Identify potential avenues for future research based on the gaps and limitations identified.

Effects of urbanization on sentinel behaviour could be an interesting avenue for research

Urbanization on the rise and more species are in greater proximity to humans.

Many behavioural adaptations observed, but less so known about complex social behaviours like sentinel behaviour

Could help us understand if sentinel behaviour is beneficial for urban species.

Highlight the importance of considering both intrinsic and extrinsic factors in studying sentinel behavior.

**Conclusion:**

Summarize the key findings and insights gained from the study.

Reiterate the significance of the research and its contribution to the field of animal behavior.

Conclude with a brief statement about the broader implications of the findings.