Hunting adaptations in autism and neurodiversity

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Abstract

The connection between hunting traits and neurodiversity and autism was researched. Previous research has shown that the evolutionary adaptations to confrontation hunting practiced by hunter & gather societies are still important and expressed in team sports. The current study expanded on this and showed that both physical and psychological adaptations to confrontation hunting are still part of the typical population, but to a lesser degree in the neurodiverse or autistic. Instead, the neurodiverse and autistic population had physical and psychological adaptations to close combat hunting, which originated with Neanderthals. Rather than viewing neurodiversity as a set of independent traits, it can more successfully be considered to be a set of connected traits that originally were successful evolutionary adaptations.

Keywords: Hunting; Evolution; Autism; Neurodiversity

Hunting adaptations in autism and neurodiversity

Autism spectrum disorder (ASD) is characterized by impairments in social interaction and communication and repetitive and stereotypical interests and behaviors (American Psychiatric Association, 2013). An alternative view of autism is that it can be seen as natural human variation and as part of neurodiversity (Jaarsma&Welin, 2012). The current research will use a combined approach where a larger population will be evaluated based on the neurodiversity concept, and then the findings will be verified on a much smaller population with an ASD diagnosis.

Valerius Geist (Geist, 1978) argued there were two principal ways of avoiding harm in combat: Either get so close to your opponent, so it cannot use its weapons (close combat hunting) or stay so far away from the opponent, so the weapons and attacks cannot reach you (confrontation hunting).

Confrontation hunting was used by modern humans. Confrontation hunting is likely to depend on both physical traits and psychological adaptations. Throwing spears with enough precision requires an excellent ability to judge distance, speed, and acceleration. People who are participating need to coordinate the hunt so they can drive prey in an optimal direction. Confrontation hunting typically occurs in dynamic groups and is time-limited. Therefore, hunts need to be organized to optimize time invested in relation to potential gain in meat. The meat also needs to be equitably shared between hunters, and ultimately, with their families, which will drive social adaptations and cheater detection. There is a lot of published evidence in regards to this. Hunting performance drives social status and mating possibilities in hunter-gatherer societies (Gurven & von Rueden, 2006). Hunting skills are learned and practiced early by children (MacDonald, 2007). Team sports have been proposed to be a means to train hunting

skills (Lombardo, 2012), and Carroll (2000) argued that sports might be viewed as a symbolic hunt. Team sports and other competitive activities are more attractive to males (Deaner et al., 2012).

The injury profile of Neanderthals was similar to that of rodeo riders (Berger & Trinkaus, 1995), and the injury profile of prey animals suggested thrusting spears were used at a close range (Gaudzinski-Windheuser et al., 2018). Therefore, Neanderthals likely used the close combat hunting method. Geist (1978) argued that all Neanderthal prey animals were hairy and that Neanderthals had exploited this in their hunting tactics. One hunter would distract the prey while the other would sneak up on it, grab its fur and cling onto it. The prey's attention then was shifted, and it got entirely focused on trying to get rid of the hunter clinging onto its back. The other hunter could then move closer and kill the prey with a thrusting spear at close distance. White, Pettitt & Screve (2016) presented an analysis of several Neanderthal hunting sites and provided a more complex picture. They appeared to have driven prey over cliffs (Bison, Mauran) or into traps (Aurochs, La Borde). At other sites, they appear to have used travertine pools as ambush sites (Rhinoceros, Taubach). At some sites, a combined tactic appeared to have been used, and visible hunter(s) would trick prey animals into moving to an ambush site (Horse, Zwolen and Reindeer, Salzgitter Lebenstedt). The authors also concluded that most of the prey selected were part of herds rather than single animals. However, this might be related to hunting opportunities at the specific sites analyzed. Duveua et al. (2019) investigated the Neanderthal social structure by looking at hundreds of footprints at Le Rozel. It was concluded that the group size was between 4 and 13 individuals, but analyzing the estimate of 10 to 13 individuals resulted in only 10% of adults. These results suggest that the Neanderthal group consisted of one adult male, one adult female, and a few children. This group composition indicates that only two

individuals took part in close combat hunting, a male and a female, which Geist (1978) suggested too.

Neanderthal DNA was introgressed into modern humans as humans migrated outside of Africa (Green et al., 2012). Therefore, it was hypothesized that the Neanderthal hunting traits are still part of the human genome, and so both types of hunting preferences should be part of today's humans. Given that the adaptations to confrontation hunting are still expressed today through things like team sports, even when nobody practices this type of hunting anymore, the same should be found for the close combat hunting traits. The phylogenetic trees created by analyzing factor loadings related to neurodiversity could predict human admixture and migration outside of Africa (Pfuhl & Ekblad, 2018). Therefore, studying neurodiversity should be ideal for finding the close combat hunting traits.

Close combat hunting is likely to depend on both physical and psychological adaptations. More acute senses (vision, hearing, tactile, and smell) were possibly adaptive to noticing potential prey animals' subtle signs. Sneaking and coordinating the actions between the two hunters would be required. The less prey animals suspected there were two people involved, the easier it would be for one of them to sneak up from behind without getting noticed. Close combat hunting occurred in a static family context, and because of this, it would not drive the same type of social adaptations as confrontation hunting. A hypothesis about which traits might relate to close combat hunting was formed in 2006, and included the following predictions:

- Walking on toes – related to sneaking
- Enjoying spinning in circles – related to an animal trying to get rid of the hunter
- Enjoying hanging upside-down – yet another way to stay on the animal
- Having an urge to jump over things – related to jumping up on top of an animal

- Enjoying digging – related to hiding a large kill
- Mimicking animal sounds – a way to trick animals
- Enjoying throwing small things – a way to trick animals that the hunter is somewhere else
- Sniffing people or things – related to tracking
- Enjoying chasing animals or people – close encounter hunting
- Enjoying biting (people) – a paralyzing tactic that Geist proposes
- Enjoying making traps – a way to trick animals

Aspie Quiz, a popular online tool that measures neurodiverse and neurotypical traits in the general population (Ekblad, 2013) was used to validate the traits in 2006. It was confirmed that they related to each other and to being neurodiverse. The close combat hunting traits were later put in the neurodiverse hunting group in version 2 of Aspie Quiz. The confrontation hunting traits were initially tested with Dyslexia and Dyscalculia in Aspie Quiz in 2009 and were put in the neurotypical hunting group in version 2. In version 3 and 4, the hunting traits were scattered in various groups, and in this process, many of them were dropped because of a high dependence between them. The current study was based on the previous work on the hunting traits, but also added new traits gained from more recent insights, and then evaluated all of them together in a single study.

Method

The research study needed a method to collect answers from a relatively large population (a few thousand). Using clinically diagnosed people was not viable, and so Aspie Quiz was used. Aspie Quiz contains 121 standard items that give participants a neurodiverse score, a neurotypical score, and a neurotype. The score difference (neurodiverse score – neurotypical

score) was used to determine neurotype, and 35 or above was judged as neurodiverse (ND), -35 or below as neurotypical (NT), and scores in between as mixed. Aspie Quiz was scored by using factor loadings from previous versions as weight factors.

Measures

Reports from older versions were inspected to find as many relevant hunting traits as possible, and items judged to have potential were added as experimental items and tested. A few new items were added as well. After evaluating these potential traits, a new version was created with the experimental items that worked well to generate a new dataset. The study used a total of 134 items. All items could be skipped by selecting the “?” answer, which was selected by default. In the introduction, mandatory questions about age (year and month of birth), sex, and ASD diagnosis were asked.

Participants

Typically, several hundred participants complete the Aspie Quiz survey every day. Participants found the website from many different sources, which made recruitment randomized. The study was not announced anywhere, and data was collected in a short time frame between August 7, 2020, and August 18, 2020. A total of 6,390 answers were collected, but to increase data quality, participants who had left ten or more items unanswered were filtered out, resulting in a dataset with 4,903 answers. 2,398 participants were neurodiverse (1,768 females and 630 males), and 1,167 participants were neurotypical (602 females and 565 males). Age was ($M = 30$, $SD = 13$) for males and ($M = 29$, $SD = 11$) for females. 362 participants (206 female and 156 male) had a professional ASD diagnosis. A control group was needed to evaluate how ASD diagnosis was related to various measures. The selected control group consisted of

neurotypical participants, but participants in this group with a professional ASD diagnosis were excluded from the analysis (12 females and 16 males).

Statistical methods

Factor analysis was the primary analysis method and was done with STATA 14. The iterated factor method was used, all items were part of the analysis, and ten factors were extracted. Because of the algorithm used, only participants who answered all items were used (1,481). The analysis resulted in one factor with a 30.5 eigenvalue, one with a 5.8 eigenvalue, and eight additional factors with eigenvalues between 1.0 and 2.4. The factors showed high dependency, and so were rotated with the Oblimin method.

Two types of relevance estimates for items were calculated. The correlation to the Aspie Quiz score difference was labeled the neurodiversity relevance estimate and was the relevance estimate defined in the article describing the construction process of Aspie Quiz (Ekblad, 2013). The correlation between the ASD diagnosis group and the control group was labeled the ASD relevance estimate. Both relevance estimates were calculated as pairwise correlations. The significance level was set to $.05 / 134$, which compensated for multiple comparisons.

Sex-bias for items was calculated by comparing male and female scores using a t-test. Analysis of confrontation hunting items used only the neurotypical population, while the analysis of the close combat hunting items used only the neurodiverse population. The reason for using either only the neurodiverse or only the neurotypical population was because only the sex-bias in the population linked to the traits was considered interesting. The significance level was set to $.05$ since the intention was not to find one or only a few sex-biased items rather validate sex-bias per item. If a considerable number of the items showed a sex-bias and the tendency pointed in

different directions for different items, not compensating for multiple comparisons should be acceptable.

Results

Cronbach's alpha was .97, average inter-item covariance was .11, and 22 items were reversed. The high Cronbach's alpha value indicated that the scale was reliable. After doing factor analysis on all items, and Oblimin rotation of the resulting factors, four factors relating to the hunting traits were easily identified: Factor 1 was identified as confrontation hunting psychological traits (neurotypical hunting factor), factor 2 was identified as close combat hunting perception traits (neurodiverse perception factor), factor 3 was identified as close combat hunting psychological traits (neurodiverse hunting factor) and factor 9 was identified as confrontation hunting perception traits (neurotypical perception factor). Items part of these factors are listed in table 1-4, along with their neurodiversity and ASD relevance estimates, and sex-biases. Items with significant factor loadings to more than one factor were generally assigned to the factor with the highest factor loading. This method provided a natural cut-off for how many items to list with each factor that didn't depend on a fixed lower limit for the factor loadings. Only sex-biases for items with a significant t-test difference ($p < .05$) were listed in the tables, while non-significant sex-biases were left blank.

Table 1. Neurodiverse hunting factor

Item	Loading	Relevance	ASD	Male	Female
Do you get an urge to climb?	.69	.39	.29		
Do you have an urge to jump over things?	.65	.47	.40	1.11	1.03
Do you enjoy sneaking through the woods?	.59	.39	.25		
Do you enjoy to throw small things like stones?	.59	.43	.30	1.36	1.28
Do you have a fascination with fire?	.57	.38	.25	1.37	1.21
Do you like to dig holes in the ground?	.56	.42	.34		
Do you enjoy spinning in circles?	.54	.48	.52		
Do you enjoy hanging upside down?	.54	.39	.34	0.81	0.93
Do you enjoy chasing animals?	.51	.35	.29		
Do you have a fascination for caves?	.50	.36	.29	0.96	0.86
Do you enjoy mimicking animal sounds?	.43	.48	.40		
Do you have a fascination for slowly flowing water?	.43	.52	.44	1.28	1.36

Do you enjoy walking on your toes?	.40	.48	.50	0.95	1.04
Do you enjoy lying on the ground looking at the sky?	.37	.29	.14	1.47	1.59
Do you feel good in mist or fog?	.35	.22	.16	1.43	1.28
Do you have an urge to observe the habits of animals?	.35	.49	.39		
Do you like to examine hair?	.30	.45	.38	0.90	1.05
Do you like to sniff things?	.30	.46	.34		
Do you scan your environment for good hiding places?	.29	.54	.50		
Do you enjoy biting people - if they let you?	.29	.36	.28	0.84	0.95
Do you use small sounds that others don't seem to use?	.28	.60	.61		
Do you love to collect things?	.26	.51	.48		
Do you rock back-&-forth or side-to-side (e.g. for comfort, to calm yourself, when excited or overstimulated)?	.24	.59	.60	1.29	1.39
Do you wring your hands, rub your hands	.23	.61	.56	1.61	1.67

together or twirl your fingers?

Have you been fascinated about making traps? .23 .30 .27 1.84 1.43

Do you mistake noises for voices? .22 .58 .56

Do you have a strong grip? .21 .05 1.14 0.93

Table 2. Neurodiverse perception factor

Item	Loading	Relevance	ASD	Male	Female
Are you sensitive to changes in humidity and air pressure?	.53	.49	.42	1.36	1.52
Do you have extra sensitive hearing?	.48	.52	.56	1.41	1.49
Are your eyes extra sensitive to strong light and glare?	.48	.50	.44	1.59	1.66
Do you naturally communicate feelings with animals?	.47	.43	.28	1.41	1.57
Are you concerned about animal welfare?	.44	.23	.13	1.51	1.73
Are you bothered by clothes tags or light touch?	.38	.60	.60		
Do you suddenly feel distracted by distant sounds?	.38	.65	.60		
Do you have an urge to observe the habits of animals?	.37	.49	.39		
Do you notice patterns in nature?	.37	.42	.36	1.67	1.57

Do you dislike it when people stamp their foot in the floor?	.35	.48	.43	1.36	1.44
Do you instinctively become frightened by the sound of a motor-bike?	.31	.50	.53	0.92	1.27
Do you dislike when people walk behind you?	.28	.55	.41	1.74	1.80
Do you tend to shut down or have a meltdown when stressed or overwhelmed?	.27	.59	.50	1.69	1.84
Do you have certain routines which you need to follow?	.27	.49	.47		
Before doing something or going somewhere, do you need to have a picture in your mind of what's going to happen so as to be able to prepare yourself mentally first?	.26	.56	.44	1.73	1.82

Factor loadings, Aspie Quiz relevance estimate, correlation to ASD diagnosis and t-test results

per gender when there is a significant score difference in the neurodiverse population ($p < .05$).

Table 3. Neurotypical hunting factor

Item	Loading	Relevance	ASD	Male	Female
Are you poor at organizing your work and / or life?	-.77	.38	.36	0.82	0.71
Do you need a lot of motivation to do things?	-.65	.46	.38		
Are you easily distracted?	-.62	.46	.39	0.98	1.07
Do you mix up dates and times and miss appointments?	-.53	.45	.39		
Do you have a poor concept of time?	-.51	.53	.49	0.34	0.46
Do you find it difficult to take notes in lectures?	-.48	.47	.44	0.61	0.49
Do you have irregular sleeping patterns?	-.40	.40	.37	0.96	0.76
If there is an interruption, can you quickly return to what you were doing before?	.39	-.50	-.46	1.32	1.20
Do you work slowly on jobs you dislike?	-.39	.43	.37		
Can you easily remember verbal instructions?	.35	-.47	-.43	1.27	1.15
Do you find it very hard to learn things that	-.35	.48	.37		

you are not interested in?

Do you have problems filling out forms?	-.31	.50	.53

Do you fiddle with things?	-.25	.54	.45	1.05	0.96

Do you have difficulty describing & summarising things for example events, conversations or something you've read?	-.22	.51	.47	0.49	0.58

Table 4. Neurotypical perception factor

Item	Loading	Relevance	ASD	Male	Female
Can you throw things with precision?	.51	-.19	-.26	1.16	0.89
Do you find it easy to estimate the age of people?	.47	-.34	-.31		
Do you have difficulties judging distances, height, depth or speed?	-.40	.50	.48	0.28	0.60
Do you have a strong grip?	.32	.05		1.07	0.78
Do you instinctively know when it is your turn to speak when talking on the phone?	.31	-.58	-.57		
Do you have a good sense of how much pressure to apply when doing things with your hands?	.30	-.40	-.45		
Can you easily remember verbal instructions?	.30	-.47	-.43	1.27	1.15
Do you enjoy team sports?	.30	-.34	-.32	1.00	0.70
Do you have trouble reading clocks?	-.27	.41	.34	0.11	0.21
Do you confuse left and right?	-.26	.38	.32	0.22	0.43

Do you have problems finding your way to new places?	-.25	.47	.44	0.48	0.67

Factor loadings, Aspie Quiz relevance estimate, correlation to ASD diagnosis and t-test results

per gender when there is a significant score difference in the neurotypical population ($p < .05$).

All items part of the factors (except for having a strong grip, which will be elaborated on later) had the expected connection to the neurodiverse and neurotypical neurotypes as evidenced by the neurodiverse relevance estimates (labelled as “Relevance” in the tables). The ASD relevance estimates (labeled as “ASD” in the tables) were similar to and with the same sign as the neurodiverse relevance estimates, but the neurodiverse relevance estimates generally were higher. This difference should be expected since the diagnostic process only deals with harmful traits and a narrow part of neurodiversity that is not directly related to the hunting traits. The similarity between the results for neurodiversity and diagnosed ASD points to neurodiversity findings being possible to generalize to diagnosed ASD.

Confrontation hunting items

Below is a list of confrontation hunting items sorted on sex-bias.

Male sex-bias:

- Throwing with precision
- Distance, height, depth and speed estimation
- Reading clocks
- Discriminating left and right
- Finding places
- Good concept of time
- A strong grip
- Won't fiddle with things
- Good with verbal instructions
- Enjoy team sports

- Easily describes & summarizes events, conversations or things read
- Hard to distract
- Handles interruptions easily

Female sex-bias:

- Organization skills
- Note taking
- Regular sleep patterns

No sex-bias:

- Age estimation
- Turn taking
- Pressure estimation
- Do things without motivation
- Do jobs on demand
- Learn things on demand
- Handles forms and applications
- Remembers dates, times and appointments

Close combat hunting items

Below is a list of close combat hunting items sorted on sex-bias.

Male sex-bias:

- Jump over things
- Throw small things
- Create traps
- Notice patterns in nature

- Fascination with fire
- Fascination for caves
- Enjoy mist or fog
- Strong grip

Female sex-bias:

- Sensitive to humidity and air pressure
- Sensitive hearing
- Light and glare sensitivity
- Dislike stomping
- Frightened by motor bikes
- Shutdowns or meltdowns
- Communicate with animals
- Concerned with animal welfare
- Dislike people walking behind
- Need to be prepared
- Hanging upside down
- Fascination for slowly flowing water
- Walking on toes
- Lying on the ground looking at the sky
- Examine hair
- Biting
- Rocking (stim)
- Hand and finger stims

No sex-bias:

- Sneaking
- Scanning for hiding places
- Dig holes
- Enjoy spinning in circles
- Enjoy chasing animals
- Observe habits of animals
- Enjoy mimicking animal sounds
- Use small sounds
- Mistake noises for voices
- Distracted by distant sounds
- Urge to climb
- Sniffing things
- Follows routines
- Collect things
- Sensitive to touch

Discussion

Many of the traits important for confrontation hunting got higher scores from neurotypical males, which was expected when confrontation hunting was primarily a male activity in the evolutionary past. Only very few neurotypical population traits got higher scores from females, but this was likely because there was no focus on gathering traits in the study. Traits related to spear throwing got higher scores from neurotypical males, and so did traits related to knowing left and right (useful for quick instructions during hunting), sense of time, and

finding places. Describing and summarizing events (hunts), and being good with verbal instructions also got the highest scores from neurotypical males. These results confirm the existence of a set of physical and psychological adaptations to confrontation hunting in the male neurotypical population.

The close combat hunting traits didn't show a clear connection to only one sex and instead appeared to be a cooperative activity involving both males and females. Enjoying hanging upside down, biting, and examining hair got higher scores from neurodiverse females, suggesting that it was the female that clung onto the animal's fur. This role also suggested that females had the ambush role and that males would be visible to prey animals. Females having the ambush role also was supported by neurodiverse females having more acute senses, which should have been important when waiting for the right opportunity to grab an animal's fur. Lying on the ground looking at the sky might be a way to detect vibrations in the ground, and was consistent with disliking stomping, which might be related to recognizing sudden stampedes triggered by the male(s). Neurodiverse females also scored enjoying walking on toe higher, which might be related to sneaking. Neurodiverse males scored jumping over things, throwing small things, and creating traps higher.

Having a strong grip was a bit special. It had no significant correlation to neurotype, but still loaded with both confrontation hunting and close combat hunting, and got higher scores from males. It might be that it was interpreted in different ways based on neurotype and the type of hunting activities preferred. The higher score from males can potentially be explained by males generally being stronger than females. Still, the score difference was much higher in the neurotypical population than in the neurodiverse, and this lower score difference might indicate

that neurodiverse females have a firmer grip when grabbing things, which we would expect based on their close combat hunting role.

Hearing and sounds appeared to be important for close combat hunting. Neurodiverse people were more likely to use small sounds and to mimic animal sounds, which might be a distraction method. Neurodiverse people easily get distracted by sounds, probably because this was an important method to detect animals and their movements, which can often be a severe problem in a classroom setting for the autistic pupil. Neurodiverse people were more likely to mistake noises for voices, a trait related to Schizophrenia, but which here instead appears like a close combat hunting adaptation.

The relation between liking water and close combat hunting might be related to favoring places where animals drank water. Initially, the item about liking water was tested in two variants in 2006, one about liking slowly flowing water and another about being afraid of floods or fast running streams. Both of them related to neurodiversity, but slowly flowing water had higher relevance, and so was kept. Both variants of this item received higher scores from neurodiverse females. Floods might result from melting ice and could be very dangerous, so being afraid of the early signs of potentially fatal floods was an adaptive trait, especially if places near water were used for ambush. Many autistics have drowned because of their attraction to water (Martin & Dillenburger, 2019).

Neurodiverse females generally had more stims, and rocking and hand and finger stims related to close combat hunting. The role of stims might be to communicate things between hunters visually. Ekblad & Pfuhl (2017) provided evidence that several stims had a specific emotional function and that some were related to odd signals, which appears to be consistent with the finding that stims had a communication role during close combat hunting.

Both Geist (1978) and White, Pettitt & Screve (2016) propose that Neanderthals used wasteful hunting methods. However, such hunting methods are not adaptive. They cannot be the result of evolutionary processes for a species like Neanderthals that had adapted and survived hundreds of thousands of years in the ice age habitat. The finding that Neanderthals mainly targeted herds rather than single animals didn't necessarily mean they killed as many animals as possible. For instance, throwing small things might be a distraction trick to fool the animal about the hunters' position and could also be used to split animals from a herd. Especially reindeer are curious and might leave the herd to explore things that are thrown. The finding by White, Pettitt & Screve (2016) that there was an overrepresentation of young individuals might be because younger animals are more curious & playful and, therefore, easier to trick. Creating traps or obstacles to split herds might be a way to isolate and then kill a single animal only. The preference for digging might be a wish to hide kills or to build obstacles (or both).

Many of the prey animals killed by Neanderthals have large flight distances (around 100 meters) today, making it very hard to get close them. Some bird species have adapted to urban conditions by developing shorter flight distances when approached by humans (Møller, 2009), a change that has occurred in a relatively short time frame. Thus, it is possible that Neanderthal's prey was not afraid of humans or had short flight distances during the ice age. How Neanderthals killed their prey could affect flight distance: Was out of sight from the herd? Did it involve extensive pain or suffering? If this was not done properly, it might make the rest of the herd increasingly scared of humans, making them harder to approach and kill in future hunts. Females, and particularly neurodiverse females, gave higher scores for being concerned with animal welfare, which indicates that many females are appalled by animals being mistreated. Confrontation hunting was a ruthless activity where animals were stressed and wounded before

eventually dying from hemorrhage after excessive bleeding or other cruelty. However, females were typically not allowed to participate in confrontation hunting. Therefore, they couldn't punish males for being cruel to animals unless they heard about it from other hunters, and so males could get away with cruelty to animals. However, with close combat hunting, females were actively part of hunting, and so could decide to leave their partner if he couldn't kill prey quickly and painlessly, or if he did it in ways that scared the herd. Females selecting males on their hunting skills, and particularly their skills at doing it quickly, painlessly, and out of sight from the herd, might have been adaptive in the Neanderthal context and would keep flight distances relatively short, so important prey species remained approachable. Neanderthals may also have helped animals or the herd when they were not hungry and hunting, resulting in a partly symbiotic relationship. Short flight distances, or lack of fear for humans, might have contributed to many of these species becoming extinct after getting into contact with modern humans.

Conclusion

The current study is the first (to my knowledge) that can explain the cause for many of the traits part of several DSM diagnoses, like ASD and AD/HD, and a large part of neurodiversity. It also points to the importance of using a two-species approach when researching our evolutionary past. It would be of little value to attempt to explain autistic stims, over-sensitives, social and communication problems, or problems with team sports using only traits from the current majority population.

Compliance with Ethical Standards

Conflict of Interest: The authors declare they have no conflicts of interest.

Data repository: Raw data from Aspie Quiz is deposited in an Open Science Framework (OSF) project, <https://osf.io/nmjwp/>

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The Aspie Quiz survey was constructed in such a way that participants could not be identified.

Informed consent: Informed consent was obtained from all individual participants included in the study. Research items in Aspie Quiz could be skipped by selecting the “?” alternative (checked by default) and skipping them had no effect on scores. Participants were informed that some items might be for research only.

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