

Gender identity in autism and neurodiversity

Leif Ekblad¹

¹Leif Ekblad, Independent researcher, Nöbbelöv 1005, 241 93 Eslöv, Sweden. Email: leif@rdos.net

Keywords: Gender identity; Autism; Neurodiversity; Relationship preference

Abstract

Gender identities that differ from biological sex (non-cisgender identities) appear to be more common in autism and neurodiversity. The study found that part of the non-cisgender identities could be related to having behavioral preferences of the opposite sex, but this failed to explain the higher prevalence in neurodiversity. Non-cisgender identities in neurodiversity could better be explained by having neurodiverse relationship preferences or lacking typical relationship preferences. Being part of the LGBT (Lesbian Gay Bi Transgender) community biased answers to questions about gender identity. Neurodiverse non-cisgender people, just like neurodiverse asexual people, might be better off with new communities that focus on the more relevant relationship preference differences rather than on narrow and indirect gender and sexual issues.

Gender identity in autism and neurodiversity

In humans, sex is categorized based on the biological reproductive organs whereas gender is the social elaboration of biological sex (Eckert & McConnel-Ginet, 2003). Infants get a male or female name based on sex. Adults treat children differently based on their sex, and gradually the child will try by to fit itself into the gender stereotypes (Eckert & McConnel-Ginet, 2003).

Children have an active role in their development of gender, something that occurs in the social environment of the child. In adolescence, peers attain a more important role in gender development. Gender is not always binary and can be seen as fluid, creative and diverse (Corwin, 2009). Terms like genderqueer, non-binary gender and non-cis have been invented to describe people that don't identify exclusively with a single gender. The term transgender is used for people that exclusively identify with the opposite gender compared to their biological sex. The term agender is used for people that don't identify with any gender. Cisgender (abbreviated as cis) is used for people whose gender identity matches the sex they were assigned at birth. Non-cisgender is used for people that are non-binary gender, transgender, agender or any other gender classification. A review of non-binary and genderqueer identities was undertaken by Richards et al. (2016) and they showed that this group was small but significant.

Autism spectrum disorder (ASD) is characterized by impairments in social interaction and communication and by repetitive and stereotypical interests and behaviors (American Psychiatric Association, 2013). Gender-dysphoria (GD) is a clinical condition describing a persistent sense of discontentment over gender identity (American Psychiatric Association, 2013). Even if the literature is limited, there is evidence that GD is more common in ASD (Glidden et al., 2016). George & Stokes (2017) found that gender-dysphoric traits mediate sexual orientation in ASD.

The present study has an additional focus on neurodiversity and human diversity in gender preferences. Neurodiversity sees “atypical neurological development as a normal human difference” (Jaarsma&Welin, 2012), hence the right to be different but not treated as ill or needing a cure (Jaarsma&Welin, 2012, Griffin&Pollak, 2009). The definition of neurodiversity used here was based on factor analysis using the Aspie Quiz online questionnaire (Ekblad, 2013). In the construction phase of Aspie Quiz, it was observed that factor analysis always resulted in two major factors and that these factors were highly stable regardless of who participated, and the exact items used. The first factor was named neurodiversity factor while the second factor was named neurotypical factor. In the construction phase, 1,800 items were evaluated using a population of 550,000 individuals. Scores were calculated by using the factor loadings as weight factors. The difference between the neurodiverse score and the neurotypical score was used to give classifications. A score difference above or equal to 35 was classified as neurodiverse (ND), a score difference below or equal to -35 was classified as neurotypical (NT), while scores in between were classified as mixed. The score difference had a .83 correlation with the Autism Quotient (AQ) test that measures autistic traits (Ekblad, 2013). Aspie Quiz had 116 standard items and five controls. The items were categorized into ten different categories, five neurotypical and five neurodiverse (talent, perception, communication, relationships and social).

The current study aims to move beyond just measuring GD or non-cisgender identity prevalence in ASD, and instead aims at generating & testing hypotheses for why non-cisgender identities are more common in neurodiversity. It was hypothesized that a small amount of non-cisgender identities is natural and that this can explain a similar amount of non-cisgender identities in both the neurotypical and the neurodiverse population. The surplus of non-cisgender identities in neurodiversity cannot be explained in this way, and so it was hypothesized that this

part is related to differences in relationship preferences. This included both having neurodiverse relationship preferences and lacking neurotypical relationship preferences.

Method

Aspie Quiz was used to collect data on sex and gender. Aspie Quiz usually only asked for sex (biological sex) in the introduction, but some people with non-binary gender identities complained, and so new introductory questions for sex and gender were introduced in Aspie Quiz. Sex at birth was asked for with the options male, female and intersex. Gender was asked for with the options male, female, transgender, agender, non-binary and other.

Measures

To be able to check if participant's profiles matched sex at birth or the opposite sex, five items with a previously known sex-bias in the neurodiverse population were added as experimental ("Do you flap your hands (e.g., when excited or upset)?", "Do you enjoy hanging upside down?", "Do you enjoy walking on your toes?", "If you have to be touched, do you prefer it to be firmly rather than lightly?", and "Do you dislike being hugged when you haven't asked for it?"). A previously used item about being homo- or bisexual ("Are you homosexual or bisexual?") (abbreviated as LGB) was added as experimental since transgender is part of the LGBT (Lesbian, Gay, Bisexual, and Transgender) concept. In the second run, four possible environmental issues were added ("Were your peers an important inspiration to you when you were a teenager?", "Did you have an authoritarian upbringing?", "Have you been bullied?", and "Have you been sexually abused?").

Participants

The study first run between November 14, 2017, and December 30, 2017, and then a second time between June 21, 2018, and July 16, 2018. A total of 28,207 participants responded. To increase the quality of the dataset, participants that had skipped more than ten ordinary items in the Aspie Quiz were excluded. An age range was also applied, and only people between 15 and 70 years old were included. This reduced the dataset to 23,088 participants. In the filtered dataset, 53.0% identified as male at birth, 46.7% as female and 0.3% as intersex. Age was ($M = 28$, $SD = 11$) years for males at birth and ($M = 32$, $SD = 12$) years for females. 52% were from the US, 15% from the UK, 7% from Canada, 6% from Australia and 20% from other countries.

Statistical methods

Due to the use of a very large dataset, significant p-values ($< .05$) were not considered enough for a meaningful result to exist, so effect sizes were also calculated and evaluated. Correlation analysis used pairwise correlations and STATA 14. Only correlation values of .1 or above were considered as meaningful. For checking hypotheses, the STATA 14 t-test was used. The effect size used for the t-test was Cohen's d, and only d values of .2 or above were considered as meaningful. Two-way ANOVAs were run with STATA 14, and the partial eta squared (η^2) effect size measure was used, and only values of .01 or above were considered as meaningful. The R mediation package (Tingley et al 2014) was used for mediation analysis.

Checking for items with a sex bias

It was hypothesized that, on average, people that self-identified as non-cisgender, would be more likely to have the traits of the opposite sex. To check this hypothesis, the population was split into a neurotypical and a neurodiverse population since neurotype affected the average

scores for items. A t-test was run both on the male and female at birth populations to check if the non-cisgender population had a significantly ($p < .05$) different score than the cisgender population. Cohen's d was then calculated for t-tests that had significance, and items with $d > .2$ were considered as sex-biased.

Finding items contributing to non-cisgender identities

Two-way ANOVAS were run with non-cisgender identity as the dependent variable and sex at birth, neurotype and various items in the model. Since STATA couldn't handle a model including all items in the same run, multiple steps with various items were run until the model converged on using a specific set of items.

Results

The prevalence of different gender identities is presented in Table 1. Transgender was approximately four times more common in the neurodiverse population as in the neurotypical but didn't differ much based-on sex at birth. In the neurodiverse population, agender, non-binary and other were all at least three times more common in the female at birth population as in the male at birth population. In the neurotypical population, agender, non-binary and other were all rather uncommon.

Table 1. Prevalence of different gender identities per sex at birth, ASD diagnosis and Aspie Quiz classifications.

	Male				Female			
	ASD	ND	Mixed	NT	ASD	ND	Mixed	NT
N	767	3075	3198	5973	867	5529	2744	2504
Age (years)	27.8	30.1	29.0	26.2	31.1	30.5	33.1	34.9
Cisgender	91.1%	90.4%	96.0%	98.0%	78.2%	79.2%	89.8%	95.9%
Transgender	4.4%	5.0%	2.0%	1.2%	4.0%	4.8%	2.5%	1.1%
Agender	0.9%	0.6%	0.5%	0.2%	3.7%	3.2%	1.4%	0.4%
Non-binary	3.3%	3.4%	1.1%	0.4%	12.0%	11.1%	5.5%	2.2%
Other	0.3%	0.6%	0.4%	0.2%	2.1%	1.7%	0.8%	0.4%

Population sizes, average age and percentage in different gender identities in different groups.

The ND, mixed and NT groups are based on Aspie Quiz classifications. The ASD classification is based on professionally diagnosed ASD.

Items with a significant cisgender/non-cisgender difference and $d > .2$ for at least one sex are presented in Table 2 for the neurotypical population and in Table 3 for the neurodiverse. 13 of 51 (25%) of the items in the neurotypical population and 16 of 35 (46%) in the neurodiverse had $d > .2$ in both sexes, but not a single of these showed an opposite sex-bias in the cisgender compared to the non-cisgender population. Relaxing the criteria a bit and only requiring one sex to have $d > .2$, and the sex-bias going in opposite directions in the non-cisgender and cisgender

populations, 15 of 51 (29%) of the items in the neurotypical and 1 of 35 (3%) in the neurodiverse population had the hypothesized opposite sex-bias.

Table 2. Significant sex-biases in the neurotypical population between cisgender and non-cisgender participants

Item	Male at birth			Female at birth		
	Cis score	Non-cis score	Cohen's d	Cis score	Non-cis score	Cohen's d
* Do you notice patterns in things all the time?	0.88	0.92		0.96	0.76	0.25
Do you find it difficult to take messages on the telephone and pass them on correctly?	0.30	0.17	0.26	0.20	0.20	
Do you find it difficult to take notes in lectures?	0.63	0.52		0.54	0.39	0.22
Are you easily distracted?	1.00	0.92		1.15	0.94	0.29
Do you need a lot of motivation to do things?	1.06	1.00		1.26	0.93	0.42
* Do you have problems finding your way	0.51	0.40		0.42	0.65	-0.29

to new places?

Do you work slowly on jobs you dislike?	1.00	0.92		1.11	0.85	0.32
Do you have trouble reading clocks?	0.19	0.09	0.28	0.31	0.18	0.24
* Do you tend to shut down or have a meltdown when stressed or overwhelmed?	0.61	0.41	0.31	0.85	0.88	
* Are you sensitive to changes in humidity and air pressure?	0.44	0.29	0.25	0.56	0.63	
Are you sometimes afraid in safe situations?	0.48	0.27	0.38	0.70	0.48	0.32
* Do you have difficulties judging distances, height, depth or speed?	0.38	0.23	0.28	0.51	0.55	
Do you wring your hands, rub your hands together or twirl your fingers?	0.60	0.48		0.67	0.42	0.37
In conversations, do you use small sounds that others don't seem to use?	0.19	0.11		0.25	0.10	0.32
Do you rock back-&-forth or side-to-side (e.g. for comfort, to calm yourself, when excited or overstimulated)?	0.27	0.17	0.22	0.31	0.22	
Do you fiddle with things?	1.05	1.02		1.05	0.85	0.26

Do you find it easier to understand and communicate with odd & unusual people than with ordinary people?	0.79	0.57	0.29	0.95	0.65	0.37
Do you have an alternative view of what is attractive in the opposite sex?	0.64	0.36	0.40	0.75	0.32	0.58
* Do you have an urge to learn the routines of people you know?	0.27	0.33		0.45	0.32	0.21
* Do you have an urge to observe the habits of humans and/or animals?	0.72	0.77		0.99	0.82	0.21
Do you have unusual sexual preferences?	1.00	0.45	0.77	0.47	0.22	0.42
Do you feel that you are a very special or unusual person?	0.92	0.74	0.24	0.72	0.63	
Do you have, or used to have, imaginary relationships?	0.60	0.25	0.59	0.62	0.41	0.29
Do you have odd hair (for example multiple whorls, standing up when short or other peculiarities)?	0.29	0.28		0.33	0.16	0.31
Do you prefer to construct your own set of spiritual beliefs rather than following	1.23	0.95	0.30	1.04	0.97	

existing religions / belief-systems?

Do you tend to develop romantic feelings						
for people that persistently shows interest	0.92	0.84		0.80	0.59	0.26
for you?						
Are you asexual?	0.19	0.05	0.39	0.26	0.11	0.34
Do you take pride in your appearance?	1.02	1.18	-0.23	1.20	1.28	
* Do you usually find faults with opinions						
that you don't share?	1.01	1.05		1.08	0.88	0.26
Do you feel as if you are being persecuted in						
some way?	0.31	0.23		0.34	0.22	0.22
* Do you find it hard to be emotionally						
close to other people?	0.61	0.73		0.75	0.59	0.22
In conversations, do you need extra time to						
carefully think out your reply, so that there	0.73	0.55	0.26	0.64	0.50	0.21
may be a pause before you answer?						
* Do you find it easy to describe your						
feelings?	1.13	1.02		1.04	1.24	-0.27
* Do you accept criticism, correction and						
direction?	1.48	1.50		1.48	1.28	0.33

Do you find it easy to estimate the age of people?	1.04	1.20		0.93	1.11	-0.23
* Do you believe in love at first sight?	0.64	0.61		0.43	0.67	-0.29
Do you enjoy hanging upside down?	0.20	0.18		0.36	0.22	0.22
Do you enjoy walking on your toes?	0.40	0.18	0.40	0.23	0.19	
Are you homosexual or bisexual?	1.25	0.22	1.70	1.33	0.42	1.12
Did you have an authoritarian upbringing?	0.51	0.54		0.36	0.73	-0.45
Have you been bullied?	1.20	0.88	0.40	1.24	0.98	
Have you been sexually abused?	0.48	0.09	0.98	0.69	0.38	0.43
Average item scores (0-2) in the neurotypical cisgender and non-cisgender population for items that had a meaningful sex-bias in one or both sexes. Items with an asterix have an opposite sex-bias in the non-cisgender compared to the cisgender population.						

Table 3. Significant sex-biases in the neurodiverse population between cisgender and non-cisgender participants

Item	Male at birth			Female at birth		
	Cis	Non-cis	Cohen's	Cis	Non-cis	Cohen's

	score	score	d	score	score	d
Do you get confused by several verbal instructions at the same time?	1.84	1.74	0.20	1.88	1.81	
Do you find it difficult to take messages on the telephone and pass them on correctly?	1.36	1.16	0.24	1.36	1.18	0.22
Do you find it difficult to take notes in lectures?	1.49	1.32	0.21	1.31	1.20	
Do you have trouble reading clocks?	0.70	0.52	0.25	0.96	0.74	0.26
Are you sometimes afraid in safe situations?	1.55	1.29	0.34	1.65	1.52	
Do you dislike it when people stamp their foot in the floor?	1.40	1.13	0.30	1.39	1.31	
Do you instinctively become frightened by the sound of a motor-bike?	1.07	0.78	0.35	1.21	1.14	
Do you have problems recognizing faces (prosopagnosia)?	0.81	0.63	0.23	0.80	0.79	
Do you find it hard to tell the age of people?	1.29	1.13	0.21	1.42	1.27	
Do you have difficulties judging distances, height, depth or speed?	1.17	0.96	0.24	1.45	1.39	

Do you wring your hands, rub your hands together or twirl your fingers?	1.58	1.44		1.68	1.47	0.29
In conversations, do you use small sounds that others don't seem to use?	0.99	0.81		1.13	0.77	0.37
Do you rock back-&-forth or side-to-side (e.g. for comfort, to calm yourself, when excited or overstimulated)?	1.28	1.06	0.26	1.48	1.18	0.36
Do you fiddle with things?	1.79	1.72		1.87	1.72	0.27
Do you mistake noises for voices?	1.26	1.11		1.30	1.07	0.28
Do you have a fascination for slowly flowing water?	1.23	1.01	0.25	1.34	1.08	0.30
Do you enjoy spinning in circles?	0.99	0.68	0.36	1.11	0.73	0.44
Do you have an urge to jump over things?	1.13	0.83	0.34	1.09	0.75	0.40
Do you feel an urge to peel flakes off yourself and / or others?	1.32	1.09	0.25	1.57	1.38	0.22
Do you have an alternative view of what is attractive in the opposite sex?	1.29	1.06	0.25	1.15	1.11	
Do you like to follow (walk behind) people	1.32	1.09	0.26	1.35	1.08	0.29

you are attached to?

* Have people you formed strong attachments to taken advantage of you?	1.40	1.21	0.21	1.40	1.48	
Do you have unusual sexual preferences?	1.41	0.97	0.48	1.10	0.73	0.38
Do you examine the hair of people you like a lot?	1.17	0.98	0.22	1.14	1.04	
Do you have, or used to have, imaginary relationships?	1.13	0.94	0.21	1.32	1.19	
Do you have odd hair (for example multiple whorls, standing up when short or other peculiarities)?	0.99	0.92		0.97	0.71	0.25
Are you more sexually attracted to strangers than to people you know well?	0.55	0.83	-0.30	0.44	0.57	
Are you asexual?	0.51	0.28	0.33	0.79	0.42	0.44
Do you prefer to hug only a romantic partner?	0.88	1.08	-0.21	0.89	1.12	-0.25
Do you flap your hands (e.g. when excited or upset)?	0.91	0.62	0.33	1.22	0.84	0.43

Do you enjoy hanging upside down?	0.79	0.55	0.27	0.96	0.64	0.35
Do you enjoy walking on your toes?	0.98	0.66	0.36	0.99	0.74	0.28
Are you homosexual or bisexual?	1.46	0.43	1.26	1.58	0.78	0.85
Have you been bullied?	1.72	1.57	0.23	1.65	1.60	
Have you been sexually abused?	0.63	0.32	0.46	1.01	0.79	0.24

Average item scores (0-2) in the neurodiverse cisgender and non-cisgender population for items that had a meaningful sex-bias in one or both sexes. Items with an asterix have an opposite sex-bias in the non-cisgender compared to the cisgender population.

The two-way ANOVA produced partial eta-squared effect sizes above .01 for the variable sex at birth, but not for neurotype, and for two items ("Are you homosexual or bisexual?" and "Are you asexual?"). These results are presented in Table 4.

Table 4. Variables contributing to non-cisgender identity

Item	df	MS	F	η_p^2
Sex	2	18.69	279.8	.025
Neurotype	2	4.91	73.5	.007
Are you homosexual or bisexual?	2	82.63	1237.5	.103

Are you asexual?	2	21.24	318.1	.029
------------------	---	-------	-------	------

Two-way ANOVA results for non-cisgender identity. All results have $p < .0001$. MS = Mean squares, effect size = partial η^2 .

Pairwise correlations were calculated between important variables. Cisgender and asexual had no meaningful correlation in the neurotypical population, but in the neurodiverse they correlated $r(2940) = -.10$, $p < .00001$ for males at birth and $r(5208) = -.19$, $p < .00001$ for females. Cisgender and LGB correlated $r(8330) = -.26$, $p < .00001$ in the neurotypical population and $r(8242) = -.38$, $p < .00001$ in the neurodiverse. Cisgender and sexual abuse correlated $r(6254) = -.18$, $p < .00001$. Cisgender and age had no meaningful correlation for males at birth, but for females they correlated $r(2504) = .15$, $p < .00001$ in the neurotypical population and $r(5529) = .28$, $p < .00001$ in the neurodiverse. When only using neurodiverse females at birth between 15 and 25 years, the correlation was $r(2195) = .20$, $p < .00001$. LGB and age had no meaningful correlation in the neurotypical population, but in the neurodiverse they correlated $r(8242) = -.25$, $p < .00001$. When only using participants 15-25 years old, no meaningful correlation was found. Asexual didn't have a meaningful correlation to age in any population. The prevalence of both non-cisgender and LGB decreased monotonously from age 15, but mostly in the late teens and it was relatively stable in the 20s and beyond.

To check the causes for why the prevalence of cisgender identities increased with age, mediation analysis was used (R mediation package). The treatment variable was set to untreated for 15-year olds and to treated for older participants. The analysis was done per neurotype and sex at birth, but only the neurodiverse female at birth population had statistically significant

results. In this population, LGB mediated a 17.5% increase, $N = 4711$, $ACME = .064$, $p < .00001$, sexual abuse mediated a 13.6% decrease, $N = 1515$, $ACME = -.038$, $p < .00001$, and asexual mediated a 5.6% increase, $N = 5016$, $ACME = .020$, $p = .012$.

Discussion

Just as in previous research studies (Glidden et al., 2016), it was found that people with ASD diagnosis had a much higher prevalence of non-cisgender identities. This higher prevalence was also present in the much larger neurodiverse population, and so this is not a specific issue only for diagnosed ASD. It was found that female at birth participants had a much higher prevalence of non-binary, agender and other, but not of transgender, regardless of neurotype. Consistent with this, the two-way ANOVA confirmed that sex at birth contributed to non-cisgender identities.

In the neurotypical population, but not in the neurodiverse, there was some support for the assumption that non-cisgender participants would score some items more like the opposite sex. Many of these items were stereotypical traits with a widely known sex-bias. The neurodiverse sex-biased traits are not widely known, and none of them resulted in the opposite sex profile in the non-cisgender population. Many sex-biased traits had a similar sex-bias in both the non-cisgender and the cisgender population.

LGB was linked to non-cisgender identity with the two-way ANOVA. LGB prevalence decreased with age in the neurodiverse population, and it could be shown that identifying as LGB caused a decrease in the late teens of non-cisgender identities in the neurodiverse female at birth population. LGB is part of the LGBT community but being homosexual or bisexual should not

be correlated to non-cisgender identities given that these issues are quite different. It's possible that the link can be explained in the context of the Social Identity Theory (Tajfel & Turner, 1979). The LGBT community can be seen as a social group based on sexual identity. By including transgender (and sometimes genderqueer) into the social group, it's possible that in-group members will become more favorable to transgender and non-binary gender identities, which might explain the link between homosexual identity, transgender, and other non-cisgender identities.

Self-identifying as asexual was linked to non-cisgender identity with the two-way ANOVA. Self-identifying as asexual was a stable trait, which is consistent with previous research (Ekblad, 2018). It could be shown that identifying as asexual caused a decrease in the late teens of non-cisgender identities in the neurodiverse female at birth population. There have been heated discussions about including asexuality into the LGBT community, and since some asexual people feel they should belong to the LGBT community, this might bias their answers about gender identity. Asexual self-identification in the neurodiverse population, but not in the neurotypical, has been linked to disgust for sexual intercourse and disliking neurotypical relationship preferences (Ekblad, 2018).

Having an authoritarian upbringing affected the prevalence of non-cisgender identity, but only for the neurotypical female at birth participants. In this group, non-cisgender participants had a much lower score on the authoritarian upbringing item than the cisgender, which probably means that some neurotypical females with an authoritarian upbringing were not allowed to identify with male traits and so this group was less likely to identify with a non-cisgender identity. It's not clear why this effect was absent in males and neurodiverse females. Having been

bullied was much more common in the non-cisgender population than in the cisgender population, but the effect was more significant for males at birth. It's most plausible that this is an effect of being different and not a causative factor. Having been bullied was also a lot more common in the neurodiverse population than in the neurotypical, which also was likely an effect of being different. Having been sexually abused was a lot more common for non-cisgender than cisgender participants, and it was also a lot more common in the neurodiverse and the female at birth population. The cause-effect relationship between sexual abuse and being born female, being neurodiverse and having a non-cisgender identity is not self-evident, but it could be shown that sexual abuse had a causal link to non-cisgender identity. Further research should explore this important issue.

There was a pattern of a rather high prevalence of non-cisgender and LGB identities in the young neurodiverse population, and especially in the female at birth population. This prevalence decreased in the late teens, probably as an effect of experience with romantic interests and relationships. In the neurodiverse population, identifying as asexual or LGB caused non-cisgender identities to become less common, which probably is an effect of creating a custom identity rather than accepting the whole LGBT in-group identity. This has important implications for prevalence research on LGB and non-cisgender identities in ASD and neurodiversity. The prevalence is expected to be dependent on age, especially in adolescence.

Just as the hypothesis suggested, several neurodiverse relationship traits related to non-cisgender identities. Having unusual sexual preferences, imaginary relationships, and an atypical view of what is attractive in the opposite sex had higher scores in the non-cisgender population

than in the cisgender regardless of sex and neurotype. Being homosexual or bisexual also is a neurodiverse relationship trait in the Aspie Quiz classification, but the link to the group is weak.

Conclusion

Gender identity seems to be a complicated issue. While the neurotypical population provided some support for the proposition that people that identify with a non-cisgender identity were born with the wrong sex, this failed to explain the higher prevalence in ASD and neurodiversity. It seemed like some participants tended to relate to multiple issues under the LGBT umbrella, even when these were not related, potentially generating a too high prevalence for non-cisgender identities. The link to asexuality (which appears to be an indirect link to disliking neurotypical relationship preferences) and to neurodiverse relationship preferences, seems to indicate that having neurodiverse relationship preferences and lacking neurotypical relationship preferences are important contributing factors to non-cisgender identities in neurodiversity and ASD. There are also links to bullying and sexual abuse.

Compliance with Ethical Standards

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

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 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.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th edn, text rev. Washington, DC: APA; 2013.
2. Corwin, A.I. (2009). Language and gender variance: Constructing gender beyond the male/female binary. *Electronic Journal of Human Sexuality*, Volume 12, Feb. 12, 2009
3. Eckert, P. & McConnell-Ginet, S. (2003). *Language and Gender Cambridge: Cambridge University Press*. ISBN: 9780511791147, <https://doi.org/10.1017/CBO9780511791147>
4. Ekblad, L. (2013). Autism, personality, and human Diversity: defining neurodiversity in an iterative process using Aspie Quiz. *SAGE Open*, 3(3), 2158244013497722.
5. Ekblad, L. (2018). Asexuality : A possible background and how it relates to autism and neurodiversity. *PsyArXiv*, August 13, <https://doi.org/10.31234/osf.io/stpma>
6. George, R., Stokes, M.A. (2017). Gender identity and sexual orientation in autism spectrum disorder, *Autism*, 2017 Sep 1:1362361317714587, <https://doi.org/10.1177/1362361317714587>
7. Glidden, D., Bouman, W.P., Jones, B.A. & Arcelus, J. (2016). Gender Dysphoria and Autism Spectrum Disorder: A Systematic Review of the Literature, *Sex Med Rev* 2016;4:3e14.
8. Griffin, E., & Pollak, D. (2009). Student experiences of neurodiversity in higher education: insights from the BRAINHE project. *Dyslexia* 15(1), 23-41.
9. Jaarsma, P., & Welin, S. (2012). Autism as a natural human variation: reflections on the claims of the neurodiversity movement. *Health Care Analysis*, 20, 20-30.

10. Richards, C., Bouman, W.P., Seal, L., Barker, M.B., Nieder, T. & T'Sjoen, G. (2016). Non-binary or genderqueer genders. *International Review of Psychiatry*, 28:1, 95-102, DOI: 10.3109/09540261.2015.1106446
11. Tajfel, H., & Turner, J. C. (1979). An integrative theory of inter-group conflict. In W. G. Austin & S. Worchel (Eds.), *The social psychology of inter-group relations* (pp. 33–47). Monterey, CA: Brooks/Cole.
12. Tingley, D., Yamamoto, T., Hirose, K., Keele, L., & Imai, K. (2014). Mediation: R package for causal mediation analysis. *Journal of Statistical Software*, 59(5).