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RESEARCH ARTICLE

The importance of home: Satisfaction with accommodation, neighborhood, and life in adults with autism

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Abstract

Although good quality housing and a socially cohesive neighborhood are associated with a higher well-being in the general population, housing is a rarely studied topic in autism research. In the present study, we describe the housing situation of a large sample of adults with autism and mostly (above) average intellectual abilities ($n = 1429$; 17 to 84 years), and examine predictors of independent living, accommodation satisfaction, neighborhood satisfaction, and satisfaction with life based on an online survey. The outcomes of independently living adults were compared with those from a Dutch community sample ($n = 929$). Nearly 80% of the autistic adults lived independently. Older participants, women, and those with higher self-reported IQ's were more likely to live independently. Autistic adults living independently were equally satisfied with their accommodation and neighborhood as the comparison group, but were less satisfied with their life in general. In both groups, higher satisfaction with accommodation and neighborhood was associated with higher life satisfaction. We advocate further research to better understand and anticipate the housing needs of the growing group of adults with autism.

Lay Summary

The living situation of autistic adults has rarely been studied. We found that 79% of autistic adults with mostly (above) average intellectual abilities lived independently. Women, older adults, and those with higher IQ's were more likely to live independently. They were equally pleased with their house and neighborhood as adults from a Dutch community sample, but autistic adults were less satisfied with their life in general.

KEYWORDS

adulthood, autism, housing, independent living, life satisfaction, neighborhood

The ache for home lives in all of us. The safe place where we can go as we are and not be questioned. -Maya Angelou

INTRODUCTION

Living in good quality accommodation and a safe, socially cohesive neighborhood is associated with a

higher well-being (Jones-Rounds et al., 2014; van Beuningen, 2018). The importance of good residential accommodation for subjective well-being may even be higher for autistic adults, given that they probably spend more time at home due to low employment rates (Roux et al., 2013), are less inclined to socialize (Stacey et al., 2018), and tend to get overwhelmed by sensory stimuli in the environment (Ben-Sasson et al., 2009). Yet, housing is a rarely explored topic in autism research

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(Scheeren & Geurts, 2015), despite the fact that accommodation costs make up the largest proportion of total societal costs of care for autistic adults in the UK and US (Buescher et al., 2014). In the present study, we describe the living situation of a large group of adults with autism and (mostly) average intellectual abilities, examine predictors of independent living, and compare accommodation, neighborhood, and life satisfaction between autistic adults and a matched community sample.

Even with the worldwide trend towards deinstitutionalization (Mandell, 2017), only a minority of autistic adults live independently (Anderson et al., 2014; Hewitt et al., 2017). An estimated half of all autistic individuals continues to live with parents well into adulthood (Howlin & Moss, 2012). Understandably, aging parents often express deep concerns about the (future) living situation of their adult child with autism once they are no longer able to take care of and support them (Chamak & Bonniau, 2016; Marsack-Topolewski & Graves, 2020). Although a high level of dependency in autism is common regardless of IQ, autistic adults with higher intellectual ability are more likely to live independently than those with intellectual impairments (Billstedt et al., 2011). In a late-diagnosed autism sample ($n = 255$), comprising a relatively high proportion of females (64%), just over half reported living alone or together with a romantic partner (Gotham et al., 2015). This finding sheds a more positive light on the potential for independent living among autistic adults without intellectual disabilities. Although it should be noted that independent living, alone or with a partner, may not always be a desired goal for every individual with autism.

Based on general population studies it is well established that accommodation and neighborhood properties are associated with people's well-being. In a large cross-sectional study across eight European cities ($n = 5605$), high quality residential accommodation and good physical, social, and economic neighborhood characteristics were associated with a higher well-being of inhabitants (Jones-Rounds et al., 2014). Moreover, a socially cohesive neighborhood buffered the negative effect of poor housing quality. Similarly, when randomly selected low-income families in the US moved to a better, low poverty neighborhood, as part of the Moving to Opportunity study, long-term (10–15 years) positive effects on subjective well-being were found, even though family income did not change (Ludwig et al., 2012). The latter study was unique in showing a causal link between neighborhood characteristics and well-being. Neighborhood's impact usually remains unclear, because people living in the same type of neighborhood commonly share individual and family risk factors, such as unemployment, psychopathology, belonging to an ethnic minority, or having a low household income. For example, individuals with a low income tend to reside in poor neighborhoods, making it difficult to disentangle the unique effects of neighborhood's income level and individual

income level. Research has repeatedly shown that poor people tend to experience more psychological distress than wealthy people (e.g., Isaacs et al., 2018; Lever et al., 2005; Rojas, 2011), contributing to a lower well-being.

In the general population, several other individual and contextual characteristics related to housing have been identified as predictors of mental health. For instance, living or growing up in the city is a known risk factor for mental health problems and a lower life satisfaction (Krabbendam et al., 2020; Okulicz-Kozaryn & Valente, 2020). This "urban malaise" is likely caused by an accumulation of factors including social stressors, poverty, crime, noise pollution, and limited access to nature. High housing costs and tenancy (vs. homeownership) were also reported as risk factors for increased depressive symptoms (Park & Seo, 2020). In the Netherlands, homeowners generally are more satisfied with their accommodation than tenants (van Beuningen, 2018), and they have a higher household income than tenants (Boelhouwer, 2020). Whether homeownership, income level, or living in an urbanized area affect accommodation and life satisfaction of autistic adults to the same degree as in the general population is unknown.

An individual characteristic that may have a significant impact on accommodation and neighborhood satisfaction, especially in the case of people with autism, is sensory sensitivity (Crompton et al., 2020; Mostafa, 2010). A majority of autistic individuals experiences hypo- and/or hypersensitivity to sensory stimuli such as sounds, smells, and light (APA, 2013). High sensory sensitivity has been associated with a poor Quality of Life in autism (Lin & Huang, 2019). Therefore, experts identified environmental sensory stimuli and sensory processing as a priority topic for future research and practice in residential care for older people with autism (Crompton et al., 2020). In the same line, Nagib and Williams (2017) found that 87% of parents ($n = 168$) reported that their autistic child was sensitive to noise, including noise coming directly from outside the home such as traffic sounds (73%) and noises within the home, most often produced by other family members or household appliances (80%). Together, these findings suggest that sensory sensitivities in autism may have a negative impact on accommodation and neighborhood satisfaction.

In the present study, our first objective was to examine the degree and predictors of independent living in a large sample of autistic adults (mostly) without an intellectual disability. Given participants' similarity to the Gotham et al. sample (2015) (generally late ASD diagnosis and relatively many females), we expected that most autistic adults would live independently and that having a higher intellectual ability would increase their chances of independent living. Other predictors of independent living that were explored included: age, gender, autism

traits, and co-occurring psychiatric conditions. By doing so, we aimed to get a better understanding of the characteristics of independently living adults with autism. A second study objective was to compare and predict satisfaction with accommodation, neighborhood, and life in general in independently living autistic adults and a community sample. In view of the sensory sensitivities associated with autism and an overall lower income level (due to un- and underemployment; e.g., Harvery et al., 2021; Roux et al., 2013), we expected autistic adults to be less satisfied with their accommodation and neighborhood than a community sample. Other predictors of accommodation and neighborhood satisfaction considered were: sensory sensitivity, autism traits, co-occurring psychiatric conditions, gender, household income, homeownership, urbanicity, social cohesion, experienced nuisance and physical deterioration of the neighborhood. Furthermore, given the expected larger amount of time spent at home, the association between accommodation/neighborhood satisfaction and general life satisfaction was predicted to be even stronger in autistic adults.

METHOD

Participants

Participants included 1429 autistic adults (625 men; 789 women; 15 individuals identifying as “other” gender) from the Netherlands Autism Register, a longitudinal online cohort of autistic individuals that is surveyed yearly (<https://www.nederlandsautismeregister.nl/english/>). Only people with a diagnosis of ASD as established by an authorized professional such as a psychiatrist (working independently from the Netherlands Autism Register) are eligible to participate. The majority (92%) completed the survey themselves; data for the remaining 8% were based on reports from their legal representatives (mostly parents). Mean age of the participants was 43.1 years ($SD = 14.0$; range = 17 to 84 years) and most (82%) had received their ASD diagnosis in adulthood (M age ASD diagnosis = 34.4 years; $SD = 16.2$; range = 1 to 75 years) (Table 1).

Comparison data were derived from a 3-yearly housing market survey of Statistics Netherlands (BZK/CBS, WoON, 2018). All respondents lived in a private household and were core members (either head of the household or partner) of the household they reported on. This community sample originally consisted of 58,849 people. Because the independently living autistic adults from the Netherlands Autism Register ($n = 1132$) were substantially younger, higher educated, more often Dutch, lived in more urbanized areas and had a lower household income than the community sample (see Table S1), a group from the community sample ($n = 932$) was selected based on matching characteristics. Case-control matching was used in the Statistical Package for Social

TABLE 1 Descriptive statistics of the complete sample of autistic adults

Variable	%
Gender	
Men	43.7
Women	55.2
Other (e.g., non-binary)	1.0
Ethnicity	
Dutch	97.2
Non-Dutch	2.8
Self-reported IQ	
IQ ≥ 116 (above average)	65.3
IQ 71 to 115 (average)	29.7
IQ ≤ 70 (intellectual disability)	5.0
Highest educational level (successfully finished)	
Low	17.9
Middle	33.5
High	48.6
Co-occurring psychiatric condition	
Yes	46.3
No	48.6

Sciences (SPSS version 26), tolerating zero deviance for the categorical variables age, educational level and ethnicity, and tolerating a deviance of “1” for gross household income (i.e., 10,000 euro) and urbanicity level. This resulted in two groups with a comparable distribution of age, educational level and ethnicity (see Table 2 and Figure S1). Autistic participants were more likely to live in very highly urbanized areas and had a significantly lower household income than the comparison group. Both of these variables were entered as predictors in the regression analyses and were controlled for.

Measures

Independent living

Independent living was assessed in the autism sample with a closed ended question: “Which situation best fits your current living situation?” The respondent could tick one or more answers: (1) living with parent(s)/caregiver(s) or family; (2) living independently alone without housing assistance; (3) living independently with partner and/or children (without housing assistance); (4) living independently alone with housing assistance; (5) living in a form of housing with support and/or care; (6) living in a healthcare facility, and (7) other. Based on this question a dichotomous variable for independent living was created (0 = does not live independently; 1 = lives independently). All adults who indicated they were living, at least partially, with parents or family (1), in a form of housing with support and/or care (5) or a healthcare

TABLE 2 Proportion scores on demographic variables of independently living autistic adults and matched adults from a community sample

	Autism sample living independently (<i>n</i> = 895) %	Matched community sample (<i>n</i> = 929) %	Group comparison with matched community sample (χ^2)
Age (categorical)			2.30 n.s.
17–24 years	3.4	2.3	
25–34 years	18.9	18.9	
35–44 years	23.2	23.9	
45–54 years	26.7	26.5	
55–64 years	21.9	22.6	
65–74 years	5.3	5.3	
75 years and older	0.7	0.5	
Educational level			0.21 n.s.
Low	10.6	11.3	
Middle	33.0	32.8	
High	56.4	55.8	
Ethnicity			0.01 n.s.
Dutch	97.6	97.5	
Non-Dutch	2.4	2.5	
Yearly gross household income ^a			75.33***
€0 to 10.000	4.1	3.4	
€10.000 to 20.000	27.4	14.3	
€20.000 to 30.000	15.8	25.0	
€30.000 to 40.000	16.5	12.9	
€40.000 to 50.000	12.1	16.6	
€50.000 to 60.000	7.9	6.5	
€60.000 to 70.000	5.3	7.2	
>€70.000	10.9	14.1	
Urbanicity level municipality			55.82***
Very highly urban (= > 2500 addresses per km ²)	29.1	16.6	
Highly urban	32.6	36.3	
Moderately urban	16.8	22.1	
Modestly urban	11.3	17.5	
Not urban (<500 addresses per km ²)	10.3	7.5	
Homeownership			13.33**
Yes, homeowner	50.5	57.9	
No, social tenancy	37.3	29.4	
No, other tenancy	12.2	12.7	
Type of accommodation			15.24***
Detached house	8.9	12.1	
Apartment	35.8	27.8	
Other (e.g., terraced house)	55.3	60.2	

^aMean and median gross household income per year in the Netherlands was respectively €69.100 and €53.400 in 2018, and €73.700 and €55.600 in 2019.

****p* < 0.001;

***p* < 0.01.

facility (6), were assigned to the non-independent living group. All others, including those who received some housing assistance, were assigned to the independent living group.

Homeownership

If the individual with autism lived independently, this would be followed-up by a question about

homeownership (Do you have a rental or owner-occupied home?). Participants were categorized as “homeowner” (1) or “tenant” (0).

Accommodation satisfaction and neighborhood satisfaction were both assessed on a 5-point scale ranging from (5) “very satisfied” to (1) “very dissatisfied.”

General satisfaction with life

Adults with autism or their legal representatives rated respectively their own life or the life of the person with autism on an 11-point scale where “10” indicates the best life they can imagine and “0” indicates the worst life they can imagine (Cantril, 1965).

Social cohesion of the neighborhood was measured with a six-item questionnaire developed by Statistics Netherlands (van Beuningen, 2018). Each item contains a statement about the neighborhood such as: “I have a lot of contact with other local residents.” Ratings range from totally agree (5) to totally disagree (1). One item (“People hardly know each other in this neighborhood”) was reverse coded. All item scores were summed to create a total score ranging from 6 to 30; higher scores indicate greater social cohesion. Internal consistency of the measure was good as indicated by a Cronbach’s alpha of 0.80 in the autism sample and 0.88 in the matched community sample.

Gross household income was assessed with a closed-ended question: What is the gross annual income in your current household? Respondents could tick one of the following answers: 0 to 10.000 euro (i.e., 9.999 euro per year would be the highest possible income in the lowest income category), 10.000 to 20.000 euro, 20.000 to 30.000 euro, 30.000 to 40.000 euro, 40.000 to 50.000 euro, 50.000 to 60.000 euro, 60.000 to 70.000 euro, ≥ 70.000 euro, “unknown,” or “I don’t want to answer this question.” The latter two categories were recoded as missing values.

Urbanicity is based on participants’ postal code and is operationalized by the density of addresses per square kilometer, averaged per municipality, containing five levels: “very highly urban” (≥ 2500 addresses per km^2), “highly urban” (1500 to 2500 addresses per km^2), “moderately urban” (1000 to 1500 addresses per km^2), “modestly urban” (500 to 1000 addresses per km^2) and “not urban” (< 500 addresses per km^2).

Respondents from the community sample received the same questions as the autism sample about homeownership, social cohesion of the neighborhood, accommodation satisfaction, neighborhood satisfaction, and satisfaction with life in general. Gross annual household income in the community sample was originally a continuous measure, but for the sake of comparison, data were regrouped in identical income categories. Urbanicity was assessed similarly in the community sample.

Information in the autism sample only

IQ was based on self-/proxy-reported IQ categories ranging from an IQ below 40 (severe intellectual disability) to an IQ above 130 (gifted). IQ ratings were either based on the outcome of a prior IQ test if available (58.4%) or estimation (41.6%). Three broad IQ categories were created and used in the analyses: intellectual disability (IQ ≤ 70), average intellectual ability (IQ 71–115), and above average intellectual ability (IQ ≥ 116). We found overlap between our self-/proxy-reported IQ measure and highest obtained educational degree (IQ ≤ 70 : 87% low, 13% middle educational level; IQ 71–115: 27% low, 43% middle, 30% high educational level; IQ ≥ 116 : 9% low, 29% middle, 62% high educational level), offering preliminary validation of the IQ measure, although academic underperformance may be relatively common in individuals with autism (Keen et al., 2016).

Co-occurring psychiatric conditions was measured by asking if the person with autism had any co-occurring psychiatric diagnosis. Response categories are: “Yes” (1), “No” (0), or “Do not know/Unknown” (missing).

Level of autism traits was examined with the Autism Quotient-Short (AQ-Short) consisting of 28 statements about behaviors, interests, and preferences (Hoekstra et al., 2011). Participants rated how much they agreed with each statement on a four-point Likert scale ranging from definitely agree (1) to definitely disagree (4). A higher score on the AQ-Short indicates more autistic traits (range: 28–112). The AQ-Short is highly correlated with the original 50-item AQ, and has good psychometric properties (Hoekstra et al., 2011).

Sensory sensitivity across five modalities (vision, hearing, taste, touch, smell) was assessed with the Sensory Perception Quotient Short (SPQ-Short) (Tavassoli et al., 2014; Weiland et al., 2020). Participants rated how much they agreed with each of 35 statements on a four-point Likert-scale ranging from definitely agree (0) to definitely disagree (3). A lower SPQ-Short score (range: 0–105) indicates a higher sensory sensitivity.

Experienced nuisance

Experienced nuisance in the neighborhood was assessed with three items developed by Statistics Netherlands: 1. To what extent do you experience noise nuisance in this neighborhood? 2. To what extent are you bothered by traffic in this neighborhood? 3. To what extent do you experience odors/dust/dirt in this neighborhood? Ratings are: (3) “often,” (2) “sometimes,” (1) “never.” Together, the items make up a nuisance score ranging from 3 to 9.

Neighborhood deterioration was assessed with four items developed by Statistics Netherlands concerning the incidence of graffiti on buildings, destruction of telephone/bus/tram booths, junk, and dog poo on the street. Ratings are: (3) “often,” (2) “sometimes,” (1) “(almost) never,” providing a maximum total deterioration score of 12.

Procedure

Autistic participants received a link to an online survey. The survey can also be completed on a participant's behalf by a parent or legal representative if the individual is younger than 16 years or unable to fill in the survey independently. The present study only includes data from autistic individuals aged 17+, matching the minimum age of participants in the Dutch community sample. All participants provided informed consent when they entered the study. The Netherlands Autism Register has been reviewed and approved by the ethics committee of the Vrije Universiteit Amsterdam (VCWE 2020-041R1). Preregistration of this study can be found at Open Science Framework (<https://osf.io/fptsq>). Comparison data from Statistics Netherlands were collected from August 2017 to April 2018 and were used following permission by the Data Archiving and Networking Services (DANS) (BZK/CBS, WoON, 2018).

Statistical analyses

First, we described the level of independent living in autistic adults and assessed predictors (age, intellectual ability, gender, autism traits, and co-occurring psychiatric conditions) of independent living with a logistic regression analysis. Second, multiple hierarchical linear regression analyses were used to predict accommodation satisfaction, neighborhood satisfaction, and satisfaction with life in independently living adults with autism and a comparison group. Other predictors, besides sample (autism = 0; comparison = 1), entered in a first step were household income, urbanicity, social cohesion in the neighborhood, and homeownership. Accommodation satisfaction and neighborhood satisfaction were also included as predictors of satisfaction with life, and vice versa. In a second step, each predictor*sample interaction

was added to the model to examine whether group moderated the association. Finally, in the independently living autism sample only, two additional multiple regression analyses were performed to predict accommodation and neighborhood satisfaction based on previously identified predictors as well as autism traits, sensory sensitivity, gender, co-occurring psychiatric conditions, experienced nuisance, and neighborhood deterioration. Significance level was set at $p < 0.006$, as we divided 0.05 by the 9 regression models we ran (1 model predicting independent living; 3 models predicting satisfaction outcomes including 3 models with interaction terms; 2 additional models in the autism sample predicting satisfaction outcomes).

RESULTS

Living situation

Based on the binary independent living variable, 79% ($n = 1132$) of the adults with autism lived independently versus 21% ($n = 297$) who, at least partially, lived with parents/family, in a form of housing with support and/or care, or in a healthcare facility (Table 3).

Predictors of independent living

Due to missing data (see Figure S1), 1156 of 1429 (81%) autistic participants (of whom 86% lived independently) were included in the logistic regression model ($\chi^2[7] = 285.85$, $p < 0.001$, Nagelkerke $R^2 = 0.40$, Cox and Snell $R^2 = 0.22$; Table 4). The sample consisted of 99.7% self-reporting adults, 58% women, 70% with an IQ of 116 or higher and a mean age of 44.3 years. Significant predictors of independent living were older age, higher self-reported intellectual ability, and female gender. Individuals living independently were on average 46.7 years ($SD = 12.3$) compared with 29.9 years ($SD = 10.7$) in the non-independent group. Those with an above average IQ (≥ 116) were more likely to live independently compared with those of average IQ (71–115). Men were 2.5 times less likely to live independently compared with women. Autism traits and co-occurring psychiatric conditions were not associated with independent living.

Because self-estimated IQs may be less reliable, we repeated the logistic regression analysis including only individuals who based their IQ report on a prior IQ test ($n = 629$; 76% with an IQ of 116 or higher). Results remained the same, that is, individuals with an above average IQ (≥ 116) were significantly more likely to live independently compared with individuals with an average IQ (71–115; $B[SE] = 0.89 [0.30]$, $OR = 2.426$, $p = 0.003$).

Because the AQ-Short, our measure of autistic traits, is not suitable for people with an intellectual disability (Hoekstra et al., 2011), many participants with an

TABLE 3 Living situation of 1429 autistic adults (17 years and older)

	<i>N</i> (% ^a)
Independently alone	462 (32.3)
Independently alone with some housing assistance	137 (9.6)
Independently with partner and/or child(ren)	547 (38.3)
Independently with partner and/or child(ren) and housing assistance ^b	17 (1.2)
With parents/caregivers/family	169 (11.8)
Form of housing with supervision and/or care	70 (4.9)
Healthcare facility	54 (3.8)
Other	18 (1.3)

^aPercentages do not add up to 100%, because some participants ($n = 45$; 3.1%) indicated that multiple living situations applied to them.

^bThis category was added to the original categories based on open answers given in the "other" category.

TABLE 4 Logistic regression model predicting independent living in autistic adults ($n = 1156$)

Predictor	<i>B</i> (<i>SE</i>)	OR (95% CI)	Wald	<i>p</i>
Age	0.14 (0.01)	1.15 (1.12–1.17)	152.19	<0.001
Self-reported IQ			11.11	0.004
IQ ≤ 70 vs. IQ 71–115	–21.36 (28345.55)	0.00 (0.00)	0.00	0.999
IQ ≥ 116 vs. IQ 71–115	0.70 (0.21)	2.02 (1.34–3.06)	11.11	0.001
Gender			17.56	<0.001
Men vs. Women	–0.91 (0.22)	0.40 (0.26–0.62)	17.05	<0.001
Other vs. Women	0.40 (0.86)	1.49 (0.28–8.07)	0.22	0.640
Autism traits	–0.01 (0.01)	0.99 (0.97–1.01)	1.88	0.170
Co-occurring psychiatry	–0.37 (0.21)	0.69 (0.46–1.04)	3.08	0.079

Note: Significant *p*-values ($p < 0.006$) are in bold.

Abbreviations: CI, confidence interval; *SE*, standard error; OR, odds ratio.

intellectual disability missed AQ-Short data. We therefore repeated the logistic regression analysis without AQ-Short score. Results for this bigger sample ($n = 1294$; including 93% self-reporting adults, 56% women, 66% with an IQ of 116 or higher and a mean age of 43.1 years) were similar, that is, older individuals ($B[SE] = 0.13$ (0.01), OR = 1.14, $p < 0.001$), those with an above average IQ ($B[SE] = 0.81$ (0.19), OR = 2.26, $p < 0.001$) and women ($B[SE] = -0.87$ (0.20), OR (for men compared with women) = 0.42, $p < 0.001$) were more likely to live independently ($\chi^2[6] = 543.40$, $p < 0.001$, Nagelkerke $R^2 = 0.54$, Cox and Snell $R^2 = 0.34$). All other associations were nonsignificant.

Additional information on homeownership and type of accommodation of independently living autistic adults can be found in the Supplement.

Predictors of accommodation satisfaction

Descriptive statistics of the three satisfaction measures and neighborhood's social cohesion measure are shown in Table 5 and correlations in Table S2. Of the autistic participants included in the multiple regression analysis predicting accommodation satisfaction, 99.4% were self-reporting adults, 55% women, 76% had an IQ of 116 or higher and a mean age of 46.5 years. As shown in Table S3, homeowners were more satisfied with their accommodation than tenants ($B[SE] = 0.33$ [0.04], $\beta = 0.18$, $t = 7.96$, $p < 0.001$). Participants living in a socially cohesive neighborhood were significantly more satisfied with their accommodation ($B[SE] = 0.02$ [0.01], $\beta = 0.09$, $t = 3.54$, $p < 0.001$). Main effects of sample, neighborhood satisfaction, and satisfaction with life could not be meaningfully interpreted, as significant interaction effects were found for all these predictors. In both groups, higher neighborhood satisfaction ratings predicted higher accommodation satisfaction, but this association was stronger in the autism sample. Higher satisfaction with life predicted higher accommodation

satisfaction, but this association was stronger in the comparison group. Level of household income and urbanicity were not associated with accommodation satisfaction.

Predictors of neighborhood satisfaction

Results of the multiple regression models predicting neighborhood satisfaction are shown in Table S4. People who were more satisfied with their life in general also were more satisfied with their neighborhood ($B[SE] = 0.06$ [0.01], $\beta = 0.11$, $t = 5.15$, $p < 0.001$). Higher social cohesion in the neighborhood predicted higher neighborhood satisfaction in both groups, but this effect was stronger in the comparison group. Higher accommodation satisfaction was associated with higher neighborhood satisfaction in both groups, but this association was stronger in the autism sample. Level of household income and urbanicity were not associated with neighborhood satisfaction.

TABLE 5 Descriptives of main outcome variables (satisfaction measures) and neighborhood's social cohesion

	Independent living autism sample ($n = 895$)	Matched comparison group ($n = 929$)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Satisfaction with accommodation (1–5)	4.1 (0.9)	4.3 (0.9)
Satisfaction with neighborhood (1–5)	4.0 (1.0)	4.4 (0.8)
Satisfaction with life (0–10)	6.1 (1.7)	7.8 (1.2)
Neighborhood's social cohesion (6–30)	19.8 (4.3)	24.7 (4.1)

Predictors of life satisfaction

Autistic adults rated their life satisfaction significantly lower than the comparison group (see Table 6). Higher household income, higher social cohesion of the neighborhood, higher accommodation and neighborhood satisfaction significantly increased life satisfaction. Homeownership and urbanicity level were not related to life satisfaction.

Predictors of accommodation and neighborhood satisfaction in the autism sample

We ran two additional multiple regression analyses to predict accommodation and neighborhood satisfaction in a subset of independently living autistic adults. In these models, we combined previously identified predictors (homeownership, social cohesion, satisfaction measures) and new predictors (autism traits, sensory sensitivity, gender, co-occurring psychiatric conditions, experienced nuisance, and neighborhood deterioration). None of the new predictors was significantly associated with accommodation satisfaction (all p 's ≥ 0.03). Likewise, none of the new predictors was significantly associated with neighborhood satisfaction (all p 's ≥ 0.02).

DISCUSSION

In this study, we examined predictors of independent living, accommodation satisfaction, neighborhood satisfaction, and satisfaction with life in a large sample of autistic adults. As expected, given the relatively high intellectual ability and late ASD diagnosis of many participants, a majority (79%) lived independently. Older adults, those with higher self-reported IQs, and women were more likely to live independently. Counter to our expectation, independently living autistic adults were equally satisfied with their accommodation and neighborhood as a matched community sample. Homeownership and a socially cohesive neighborhood predicted higher accommodation satisfaction. Higher

social cohesion of the neighborhood also predicted higher neighborhood satisfaction, but this association was stronger in the comparison group. Surprisingly, in a subgroup of independently living autistic adults, sensory sensitivity was not associated with accommodation or neighborhood satisfaction levels. Finally, as expected, higher accommodation and neighborhood satisfaction predicted higher life satisfaction, but this association was equally strong in both groups. Despite comparable and overall reasonably high accommodation and neighborhood satisfaction ratings in the group of autistic adults, they were less satisfied with their life in general than the community sample.

Independent living

Compared with the relatively similar sample of self-reporting autistic adults in the Gotham et al. (2015) study (late ASD diagnosis, more females, 42% with at least a bachelor's degree, just over half living independently), we found an even higher level of independent living. This may be related to cross-country differences or the slightly older age (M age difference = 4.5 years) and relatively high intellectual abilities of the participants in the present study, of whom 56% obtained a high educational degree (i.e., higher professional education or university). Indeed, we found that older individuals and those who reported an above-average intellectual ability ($IQ \geq 116$) were significantly more likely to live independently than younger individuals who reported an average intellectual ability ($IQ: 71-115$). Our findings suggest that younger adults and those with average IQs may require more assistance to live independently.

After controlling for factors such as age and intellectual ability, autistic women were more likely to live independently compared with autistic men. Among those aged under 30 ($n = 203$), 59% of women lived independently compared with only 40% of the men. Earlier cohabitation by women in young adulthood may partly explain this gender difference that is also reported in the general population (Mazurik et al., 2020). Indeed, in our sample, autistic women under 30 were more likely to live

TABLE 6 Multiple regression model predicting life satisfaction in independently living autistic adults and a matched comparison group

Model	B	SE	β	t	p	LB (CI)	HB (CI)
Sample	1.36	0.07	0.40	18.62	<0.001	1.214	1.500
Household income	0.11	0.02	0.13	5.72	<0.001	0.070	0.142
Homeownership	-0.18	0.08	-0.05	-2.31	0.021	-0.335	-0.027
Social cohesion neighborhood	0.03	0.01	0.10	3.80	<0.001	0.017	0.052
Urbanicity	-0.00	0.03	-0.00	-0.11	0.912	-0.053	0.047
Accommodation satisfaction	0.37	0.04	0.20	8.40	<0.001	0.281	0.451
Neighborhood satisfaction	0.24	0.05	0.13	5.15	<0.001	0.150	0.335

Note: LB (CI) = lower bound of 95% confidence interval; HB (CI) = higher bound of 95% confidence interval. Significant p -values ($p < 0.006$) are in bold.

with their unmarried partner (22%) than autistic men (10%). Gender differences in independent living also match the general trend found in the Dutch population. At the age of 22, 54% of Dutch women compared with 39% of Dutch men lived independently in 2018 (Central Bureau for Statistics, 2019). Other factors contributing to these gender differences may be parental expectations and parental support, both emotionally and financially, for adult sons and daughters (Billari & Liefbroer, 2007; Hardie & Seltzer, 2016).

Level of autism traits, as measured by the AQ-Short, and presence of co-occurring psychiatric conditions did not affect the likelihood of independent living in this sample of autistic adults. Thus, it could be that level of autism traits or having a co-occurring psychiatric condition do not influence people's ability to live independently. Alternatively, adults with many autism traits or a co-occurring psychiatric condition may receive more support and encouragement from their environment to live independently, thereby canceling out potential negative effects of autism traits and/or co-occurring conditions.

Satisfaction with accommodation and neighborhood

Contrary to predictions, adults with autism were equally satisfied with their accommodation and neighborhood as the comparison group. Predictors of accommodation and neighborhood satisfaction were also very similar. In both groups, homeowners were more pleased with their home than tenants. Homeowners generally have more financial resources than tenants (Boelhouwer, 2020) and have more opportunities to choose or adapt an accommodation to meet their specific needs and preferences. This might explain why, after controlling for homeownership and household income, autistic and nonautistic adults reported comparable satisfaction ratings. Furthermore, neighborhood satisfaction predicted accommodation satisfaction in both groups, although this association was stronger in the autism group. Adults with autism may be more sensitive to their environment or may more frequently stay at home, resulting in a stronger link between neighborhood and accommodation satisfaction. Yet, neighborhood's social cohesion was less strongly associated with neighborhood satisfaction in the autistic group. Even though adults with autism may appreciate having friendly residents nearby, these social contacts may not affect their satisfaction to the same degree as non-autistic adults. Possibly, they use a different set of criteria (e.g., physical neighborhood properties) to evaluate their neighborhood. Another explanation, in line with several reports of reduced social motivation (Chevallier et al., 2012), is that autistic adults might find social contacts in the neighborhood less important or rewarding than non-autistic adults. Yet, we did find neighborhood's social cohesion was positively associated with life

satisfaction in both groups, thus weakening the social motivation account.

The hypothesis that sensory sensitivities in the autism group would negatively affect accommodation and neighborhood satisfaction (Nagib & Williams, 2017; Tavassoli et al., 2014) was not supported by our study. While taking into account other crucial factors such as homeownership and general life satisfaction, sensory sensitivity was found unrelated to accommodation and neighborhood satisfaction. Possibly, homeowners can control the sensory stimulation in their home to a greater extent than tenants, therefore obscuring an effect of sensory sensitivity. In addition, it may be that the actual degree of (over)stimulation by environmental stimuli, rather than sensory sensitivity itself, causes dissatisfaction with the home and neighborhood. Furthermore, a post hoc power calculation revealed that statistical power was excellent (0.99) to detect a medium effect of sensory sensitivity, but poor (0.34) to detect a small effect. Lastly, the SPQ, a self-report measure of sensory sensitivity, may be too generic, as it assesses sensitivities across all modalities. Experienced nuisance in the neighborhood (by noise, odors, and traffic) and neighborhood deterioration (e.g., vandalized bus booths) were also unrelated to accommodation and neighborhood satisfaction. Autistic women and men valued their home and neighborhood similarly. Furthermore, autism traits and co-occurring psychiatric conditions were unrelated to satisfaction ratings. Thus, other factors such as homeownership seem to play a bigger role in how satisfied autistic adults are with their accommodation and neighborhood.

Satisfaction with life

Independently living autistic adults rated their life satisfaction substantially lower ($M = 6.1$) than the comparison group ($M = 7.8$). This finding is in line with some other reports of reduced subjective quality of life in adults with autism (Ayres et al., 2018; van Heijst & Geurts, 2015) although these findings are not consistent (Hong et al., 2016; Moss et al., 2017; Oakley et al., 2020). Lawson et al. (2020) previously reported a positive association between independent living and subjective quality of life in autistic adults, suggesting that life satisfaction may be lower still in adults living in healthcare facilities or with their families. Our study findings imply that independent living, although considered an important milestone in adult life, may not necessarily be an indicator of a happy life.

Several issues likely play a role in a reduced life satisfaction. For instance, having a romantic partner may protect against a low satisfaction with life. Yet, autistic adults in our study more often reported having a partner (55%) compared with the matched community sample (41%), thus ruling out this factor. Another explanation may be poor physical and mental health. Indeed, within

the community sample, three-quarters estimated their health generally as good (49%) or very good (26%). Yet, only half (53%) of the autistic adults in the present study rated their physical health as reasonably good or very good (a score of 7 or higher on a scale from 0 to 10). Moreover, almost half (48%) reported a co-occurring mental health condition such as a depression or anxiety. Although a direct comparison of physical and mental health data of the autistic and community sample was not possible, it is plausible that lower physical and mental health contributed to an overall lower life satisfaction in autistic adults.

As expected, higher accommodation and neighborhood satisfaction predicted higher life satisfaction, suggesting that high satisfaction with one's accommodation and neighborhood may "spill over" to increase general life satisfaction and/or a more positive outlook on life may shine a more positive light on every subdomain of life, such as housing (Sirgy & Cornwell, 2002). Counter to our expectation, however, the links between accommodation and neighborhood satisfaction and life satisfaction were equally strong for autistic adults and the comparison group. Furthermore, in both groups, higher social cohesion in the neighborhood predicted higher life satisfaction, in line with earlier findings (Jones-Rounds et al., 2014). In addition, people with a higher household income were more satisfied with their life. This positive effect of a higher income has been reported before, although the added value seems to diminish or disappear in the highest social-economic groups (Di Tella & MacCulloch, 2006).

Urbanicity

Even though urban living and upbringing have repeatedly been associated with lower life satisfaction and poorer mental health (Krabbendam et al., 2020; Okulicz-Kozaryn & Valente, 2020), urbanicity level was unrelated to any of the satisfaction measures in the current study. Thus, autistic adults living in a densely populated area were equally satisfied with their homes and lives as those living in less crowded areas. It should be noted though that the Netherlands as a whole is highly urbanized and densely populated, as also indicated by the low proportion (8%) of people in the community sample living in nonurban areas (i.e., areas with fewer than 500 addresses per square kilometer). Limited variance in urbanicity level may have diminished the chances of finding an effect. Alternatively, urban areas also have particular advantages, such as easy access to public transport and proximity to shops, services, and support, which may have counterbalanced any negative effects. These supposed urban benefits might also attract people with autism, possibly explaining the somewhat higher proportion of autistic adults in our study living in densely populated areas compared with the Dutch community sample.

In a Finish birth cohort study, however, life dissatisfaction and physical or mental difficulties predicted a move from a rural to an urban area (Lankila et al., 2013). Further research is needed to examine if, and why, autistic people live more frequently in cities.

Study limitations

Several study limitations should be taken into account. First, the data are based almost exclusively on self-report. Although self-report is an appropriate method to assess subjective experiences such as life satisfaction, sole reliance on self-report is not optimal when measuring autism traits or intellectual ability. Future studies should therefore include additional informants and objective tests. Second, given the sample characteristics (mostly above average intellectual abilities and late ASD diagnosis) the conclusions of this study may not generalize to all people with autism or across the full range of intellectual (dis)abilities. Third, due to the cross-sectional nature of the data, it is not possible to identify any causal relations. Finally, it is not clear whether our findings and conclusions are unique to the Dutch context, or might also apply to other countries. Housing for autistic adults in the Netherlands not only greatly varies due to individual differences in abilities and needs, but also due to local (municipal) differences in housing policy and support. Furthermore, there is a growing shortage of affordable housing for people in general, resulting in residential immobility and few housing opportunities for those with low and middle incomes (Boelhouwer, 2020), including a substantial portion of autistic adults. Indeed, 32% of autistic individuals in our study had a yearly household income below €20,000 (see Table 2), indicative of relative poverty, as it is less than 50% of the median Dutch household income (poverty as defined by the Organization for Economic Co-operation and Development). Our data also indicated that 37% of the independently living autistic adults lived in social housing compared with 25% of the complete community sample. Although accommodation satisfaction of tenants is generally lower compared with that of homeowners, satisfaction level may also vary depending on (lack of) autism-knowledge and autism-friendly policy of housing associations.

CONCLUSION

Our study showed that, in the Netherlands, a large majority of autistic adults with (above) average intellectual abilities live independently and, after accounting for other factors such as homeownership, are equally satisfied with their accommodation and neighborhood as other members from the community. Autistic adults, however, seem less satisfied with their life in general. In both groups, higher satisfaction with the accommodation

and neighborhood was associated with higher life satisfaction, indicating the importance of a good quality home. Further research is needed to understand and anticipate the housing needs of the growing group of adults with autism.

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ETHICS STATEMENT

The Netherlands Autism Register has been reviewed and approved by the ethics committee of the Vrije Universiteit Amsterdam (VCWE 2020-041R1).

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