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Psychiatry training in autism spectrum disorder and intellectual disability: Ongoing gaps and emerging opportunities

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Abstract

Autism spectrum disorder and intellectual disability are associated with psychiatric comorbidities, yet a 2009 study of US child and adolescent psychiatry program directors indicated that psychiatry residents receive insufficient training in autism spectrum disorder/intellectual disability. This follow-up study surveyed child and adolescent psychiatry and general psychiatry program directors to assess (1) the current extent of residency training in autism spectrum disorder/intellectual disability, (2) program director perceptions of educational topics and resident competency in autism spectrum disorder/intellectual disability, and (3) preferred resources to strengthen autism spectrum disorder/intellectual disability training. As in 2009, many child and adolescent psychiatry program directors reported few lecture hours, although current child and adolescent psychiatry residents saw slightly more patients with autism spectrum disorder but not intellectual disability. General psychiatry program directors reported fewer lecture hours in autism spectrum disorder/intellectual disability and fewer patients with autism spectrum disorder than child and adolescent psychiatry program directors. Both child and adolescent psychiatry and general psychiatry program directors recognized the importance of a range of educational topics in autism spectrum disorder/intellectual disability. Child and adolescent psychiatry program directors reported higher resident competency, and lecture hours and patients seen moderately correlated with resident competency. Program directors indicated that online videos and other resources would help improve autism spectrum disorder/intellectual disability training in their programs. Collectively, these findings suggest minimal improvements in autism spectrum disorder/intellectual disability training over the past decade and highlight the urgent need to advance psychiatry training in this field through dissemination of resources.

Lay abstract

Children, adolescents, and adults with autism spectrum disorder and intellectual disability experience high rates of co-occurring psychiatric conditions throughout their lifetime. However, there is a shortage of psychiatrists to treat these populations. We evaluated how much education psychiatrists-in-training receive on how to care for individuals with autism spectrum disorder/intellectual disability. We found that in many psychiatry programs, residents receive limited training experiences in autism spectrum disorder/intellectual disability involving lectures and patient contact and that psychiatry program directors would benefit from more resources to strengthen education in autism spectrum disorder/intellectual disability.

Keywords

autism spectrum disorder, education, intellectual disability, psychiatry, residency training

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Autism spectrum disorder (ASD) and intellectual disability (ID) are both prevalent neurodevelopmental disorders, with estimates in the United States of approximately 2% of children (1 in 44) having ASD (Maenner et al., 2021) and 1%–2% of children having ID (Maulik et al., 2011; Zablotsky et al., 2019). In the case of ASD, the rising prevalence over the past 20 years has culminated in a growing population of affected adults (Dietz et al., 2020). Compared to the general population, children and adults with ASD and ID have elevated rates of co-occurring psychiatric conditions and symptoms, including anxiety and mood disorders, attention-deficit/hyperactivity disorder, suicidal ideation, and aggression (Cassidy et al., 2014; Einfeld et al., 2006; Joshi et al., 2010; Lever & Geurts, 2016; Vasa et al., 2020). They also experience elevated levels of psychiatric emergencies, including emergency department visits and psychiatric inpatient hospitalizations (Kalb et al., 2012; Nayfack et al., 2014). A well-trained mental health workforce is thus essential to improving quality of life for individuals with ASD/ID and their families.

Despite this need, individuals with ASD and ID disproportionately struggle to access mental health care (Maddox et al., 2020; Malik-Soni et al., 2022; McBain et al., 2020; Whittle et al., 2018), an issue attributed to the long-standing shortage of psychiatrists with sufficient training in ASD/ID (Havercamp et al., 2016; Hsu, 2018). Over the past 25 years, several reports in the United States have documented that child and adolescent psychiatry (CAP), as well as general psychiatry (GEN) residents, receive inadequate training in ID. These findings mirror reports from psychiatrists in other countries, including Canada (Lunsky et al., 2007), the United Kingdom (Kaushal et al., 2018), Australia (Edwards et al., 2007), Singapore (Sajith et al., 2019), and Israel (Werner et al., 2013). Experts in the field, both in the United States and internationally, have repeatedly recommended expanding training in this area (Bouras, 1992; Dias et al., 2020; Menolascino & Fletcher, 1992; Ruedrich et al., 2007; Syzmanski et al., 1991; Torr et al., 2008). In a 2009 study assessing psychiatry training in both ASD and ID in the United States, CAP and GEN directors of programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) were surveyed about lecture hours and patient experiences in ASD/ID in their respective programs (Marrus et al., 2014). CAP program directors (PDs) reported deficits in ASD/ID training: a large proportion of CAP residents received as few as 3–4 lecture hours per year and saw only an estimated 1–5 patients with ASD/ID per year in clinical settings. Almost 50% of PDs reported a need for additional resources to provide ASD/ID training, with many citing a scarcity of specialized developmental disabilities clinics and faculty experts. Data from general programs were not reported in this study given the small number of responses.

Including training in ASD and ID within psychiatry residency programs is paramount for several reasons.

From an assessment perspective, the overlap between symptoms of ASD, ID, and comorbid psychiatric disorders can result in diagnostic overshadowing, thereby leading to unnecessary treatments or missed treatment opportunities (Rosen et al., 2018). In addition, lack of knowledge about a patient's developmental, educational, and medical histories and how these contribute to psychiatric presentations could potentially lead to an overreliance on psychiatric medications and physical restraints. Polypharmacy has been shown to be a major problem in ASD/ID, which is especially concerning given the higher rates of medication side effects in these populations (Esler et al., 2019; Espadas et al., 2020; Ritter et al., 2021). Behavioral therapies, a pillar of management for challenging behaviors, can be under-utilized by providers who are less familiar with these approaches, leading to further risk of polypharmacy. Individuals with ASD and ID thus require psychiatrists who can evaluate how developmental differences impact co-occurring psychiatric symptoms while appropriately integrating pharmacological, behavioral, and psychosocial interventions across the lifespan.

This study evaluates the state of psychiatry residency training in ASD/ID as of 2019. To our knowledge, this is the first study to update findings from 2009 regarding psychiatry training in ASD/ID (Marrus et al., 2014). The current study had three aims. The first aim was to assess the extent of ASD/ID training in both CAP and GEN programs and whether there were improvements for CAP programs. As in the 2009 survey, we asked PDs to indicate the number of ASD/ID lecture hours and patients seen by residents per year. In this study, we also compared the amount of training between CAP and GEN programs. A second novel aim was to examine PD perceptions of both the importance of key educational topics in ASD/ID and resident competence (i.e. knowledge, comfort, and interest), as well as the association between the extent of training and resident competence in ASD/ID. Third, we queried PDs about resources that would be helpful to improve ASD/ID training in their programs. Collectively, findings from this study were used to propose strategies to help PDs strengthen training in ASD/ID at their respective institutions.

Method

Participants and recruitment

This online survey study was conducted by the Training and Education Workgroup of the American Academy of Child and Adolescent Psychiatry (AACAP) Autism and Intellectual Disability Committee. This workgroup comprises seven physician educators from academic medical centers around the country who are dedicated to developing training resources in ASD/ID for psychiatry PDs; two members were former CAP PDs.

In this study, an email invitation to participate in an online training survey was sent in January and February 2019 to

PDs or program coordinators of ACGME-accredited psychiatry training programs. Contact information was obtained in December 2018 from a publicly available listing on the ACGME website. Psychiatry training programs included 248 general programs, 137 child and adolescent programs, 9 triple board programs, and 4 post-pediatric programs, for a total of 398 programs. In 7 cases, a director headed more than 1 program, for a total of 391 program contacts. For 114 of these programs, an email address was found for only a program coordinator, who was asked to forward the email to the director. Fourteen emails were undeliverable, resulting in a final total of 377 PDs or their program coordinators who received a study invitation. Study participation was voluntary, and three PDs opted out of the study. The initial invitation was followed by three email reminders, each 2 weeks apart, to complete the survey. All responses were anonymous, although participants had the option to disclose their institution. Specific data on respondent demographic characteristics, including age, sex, race/ethnicity, socioeconomic status, and educational attainment, were not requested. No incentives were provided. There was no community involvement in the reported study. The study was approved by the Johns Hopkins University School of Medicine Internal Review Board.

Survey design

The Training Workgroup adapted item topics and format from the survey administered by a subset of group members in 2009 (Marrus et al., 2014). Similar item content related to lecture hours, patients seen, and resource needs was maintained across the 2009 and 2019 surveys, which allowed for qualitative comparison of responses. Additional content in the 2019 survey pertained to Aim 2 of the study, which focused on PD perceptions of educational topics in ASD/ID and resident competence.

The survey (Supplemental Table 1) consisted of 18 questions probing the following domains: (1) characteristics of the ASD/ID training environment (5 questions); (2) number of lecture hours and patients seen in ASD/ID (Aim 1, 6 questions); (3) PD perceptions of fundamental educational topics essential for multidisciplinary care in ASD/ID (Aim 2, 1 question); (4) PD perceptions of resident competence in ASD/ID (i.e. knowledge, comfort, and interest) (Aim 2, 5 questions); and (5) helpful resources to improve training in ASD/ID (Aim 3, 1 question). Questions about perceptions used a 1- to 5-point scale, with 5 reflecting the greatest importance, knowledge, comfort, or interest. The survey was programmed in LimeSurvey and took 10 min to complete.

Analyses

Means and standard deviations are presented for continuous variables; proportions are presented for categorical variables. CAP training data on the number of lecture

hours/year and patients/year from the current survey were qualitatively compared to the 2009 survey data (Marrus et al., 2014). *T*-tests were used to assess group differences between CAP and GEN programs for continuous data describing program characteristics, ratings of curriculum topics, and resident competency. Mann–Whitney *U* tests for non-parametric data were conducted to compare ordinal data points involving ranges of lecture hours and patients seen. Spearman's correlations, which are used for skewed distributions, were conducted to examine correlations between the amount of training (i.e. lecture hours, patient numbers) and ratings of resident competence. For this analysis, ratings were pooled across CAP and general programs to maximize statistical power. In addition, knowledge ratings were based on a composite score that was derived from summing ratings of resident knowledge across the seven educational topics. For all analyses, triple board ($n=2$) and post-pediatric portal programs ($n=2$) were included in the CAP group due to the clinical emphasis on children in these two programs. Two directors supervised both a CAP and GEN program and reported jointly on their programs; their data were therefore excluded in the analyses comparing findings between CAP and GEN programs. SPSS 27 was used for analyses.

Results

Program characteristics

Seventy-eight PDs responsible for supervising 83 of 398 accredited psychiatry training programs completed the survey, accounting for 21% of all programs. Respondents included PDs who directed 46 CAP programs, 33 GEN programs, 2 triple board programs, and 2 pediatric portal programs. Response rates by program type were 34% for CAP programs, 13% for GEN programs, 22% for triple board programs, and 50% for pediatric portal programs.

Table 1 describes the characteristics of participating programs. As expected, CAP programs had a significantly lower number of residents compared to GEN programs ($p < 0.001$). The number of faculty experts in ASD/ID was similar across both programs ($p = 0.083$). Overall, CAP programs had significantly more specialized services for ASD/ID than GEN programs ($p < 0.01$), including more specialized outpatient ($p < 0.01$) and emergency department specialty ($p < 0.05$) services. CAP and GEN programs had a similar number of inpatient and group home/residential services, though the availability of both services was low. No group differences in research opportunities were present.

Training in child and adolescent psychiatry programs

Figure 1 depicts the number of lecture hours and patients seen per year, separated by ASD and ID, for both CAP and

Table 1. Characteristics of the ASD/ID training environment.

	CAP (<i>n</i> =45)	GEN (<i>n</i> =31)	Statistics	Effect size
Number of residents, Mean (SD)	7.32 (4.40)	25.58 (14.15)	$t(73)=6.95, p < 0.001$	$d=-1.89$
Median number of faculty experts in ASD/ID	1–3	1–3	$\chi^2(1)=0.025, p=0.87$	$w=0.02$
Specialized services for ASD/ID, <i>n</i> (%)				
Outpatient clinic	31 (69)	11 (36)	$\chi^2(1)=6.99, p=0.008$	$w=0.30$
ED services	15 (33)	2 (7)	$\chi^2(1)=6.17, p=0.013$	$w=0.28$
Inpatient unit	5 (11)	2 (7)	$\chi^2(1)=0.082, p=0.77$	$w=0.03$
Home/residential	2 (4)	2 (7)	$\chi^2(1)=0, p=1$	$w=0$
Any of the above specialized services	36 (80)	12 (39)	$\chi^2(1)=11.73, p < 0.001$	$w=0.39$
Research opportunities, <i>n</i> (%)	28 (62)	19 (61)	$\chi^2(1)=0, p=1$	$w=0$

CAP: child and adolescent psychiatry; GEN: general psychiatry; SD: standard deviation; ASD/ID: autism spectrum disorder/intellectual disability; ED: emergency department.

Effect sizes represent comparisons between child and adolescent psychiatry (CAP) and general psychiatry (GEN) programs. Positive effect sizes correspond to larger values for CAP programs. Cohen's *d* effect sizes of 0.2 are small, 0.5 are medium, and ≥ 0.8 are large; for effect sizes *w* for chi-square testing, $w=0.1$ are small, $w=0.3$ are medium, and $w=0.5$ are large. Responses for two program directors who supervised both CAP and GEN programs could not be included, as they reported jointly on their programs.

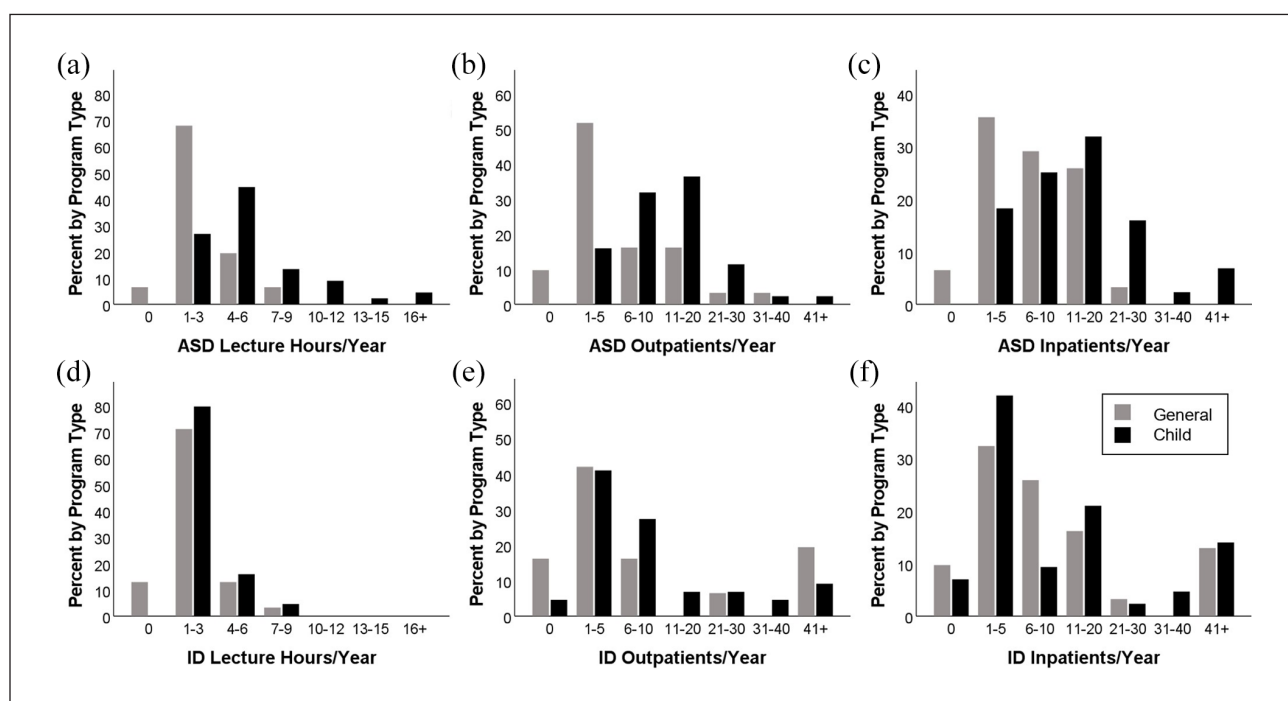


Figure 1. Distributions of yearly resident lecture hours and patients seen in ASD/ID across CAP and GEN residency programs. Panels illustrate the ranges reported by program directors for ordered amounts of yearly lecture hours, outpatients, and inpatients with autism spectrum disorder (ASD; a–c) or intellectual disability (ID; d–f). Heights of gray bars indicate the percentage of general program directors reporting a particular level of training, while heights of black bars apply to child programs.

GEN programs. For CAP training in ASD, nearly half of CAP PDs, 44%, reported 4–6 lecture hours/year (Figure 1(a)), which was comparable to findings from the 2009 survey. In terms of outpatients/year with ASD (Figure 1(b)), 36% of CAP PDs reported that residents saw 11–20 outpatients/year, 32% reported 6–10 outpatients/year, and 16% reported 1–5 outpatients/year. A similar profile was

observed for the number of inpatients (Figure 1(c)): 11–20 inpatients/year (32% of CAP PDs), 6–10 inpatients/year (25% of CAP PDs), and 1–5 inpatients/year (18% of CAP PDs). Five percent and 9% of CAP PDs reported that their residents saw 30 or more outpatients or inpatients per year with ASD, respectively. By comparison, in 2009, lower number of patients with ASD were more common: 45% of

Table 2. Program director ratings of the importance of ASD/ID educational topics.

	CAP (n=45)	General (n=31)	Statistics	Effect size (Cohen's <i>d</i>)
Assessment	4.77 (0.43)	4.00 (1.07)	$t(37) = 3.80, p < 0.001$	$d = 1.01$
Comorbidity	4.75 (0.44)	4.10 (1.01)	$t(38) = 3.38, p = 0.002$	$d = 0.89$
Psychopharmacology	4.66 (0.53)	4.07 (0.94)	$t(41) = 3.12, p = 0.003$	$d = 0.82$
Behavioral interventions	4.61 (0.54)	3.73 (0.87)	$t(44) = 4.94, p < 0.001$	$d = 1.28$
Genetics	4.13 (0.73)	3.43 (1.04)	$t(48) = 3.20, p = 0.002$	$d = 0.81$
Individualized Education Programs	4.53 (0.63)	3.37 (0.96)	$t(46) = 5.82, p < 0.001$	$d = 1.49$
Transition planning	4.27 (0.79)	3.63 (0.85)	$t(72) = 3.31, p = 0.001$	$d = 0.79$

ASD/ID: autism spectrum disorder/intellectual disability; CAP: child and adolescent psychiatry.

Program director ratings were on a scale of 1 to 5, where 1 indicated "not important" and 5 indicated "important." Effect sizes represent comparisons of child and adolescent psychiatry (CAP) to general psychiatry (GEN) programs. Positive effect sizes correspond to larger values for CAP programs. Cohen's *d* effect sizes of 0.2 are small, 0.5 are medium, and ≥ 0.8 are large.

CAP PDs reported 1–5 outpatients/year, while 42% reported 1–5 inpatients/year, with an additional 42% indicating 6–10 inpatients/year.

For CAP training in ID, 80% of CAP PDs noted 1–3 lecture hours/year, similar to 2009 (Figure 1(d)). As with ASD, CAP PDs reported a range of outpatients and inpatients seen with ID, although 5% indicated no outpatient cases and 7% indicated no inpatient cases (Figure 1(e) and (f)). The most common number of outpatients with ID was 1–5 outpatients/year (41% of CAP PDs), followed by 6–10 outpatients/year (27% of CAP PDs). For inpatients with ID, PDs most often reported that residents saw 1–5 inpatients/year (42%), followed by 11–20 inpatients/year (21%). Fourteen percent and 16% of PDs reported that their residents saw 30 or more outpatients or inpatients, respectively. These values were overall comparable to the 2009 survey, when 1–5 outpatient and inpatient cases/year were the most reported values, accounting for 55% and 38% of CAP programs, respectively.

Training in general psychiatry programs

For ASD training in general programs, 68% of GEN PDs reported 1–3 lecture hours/year and 7% reported no lecture time (Figure 1(a)), with ASD lecture hours being significantly lower for GEN versus CAP programs ($U_{ASD} = 328, p < 0.001$). In terms of outpatients/year with ASD, 52% of GEN PDs reported that residents saw 1–5 outpatients/year, and 10% indicated no outpatient cases (Figure 1(b)). Three percent of GEN PDs reported >30 outpatients/year with ASD. Inpatients/year with ASD were divided between 1–5 cases/year (36% of GEN programs) and 6–10 cases/year (29% of GEN programs), with 7% reporting no inpatient cases and no programs reporting >30 inpatient cases/year (Figure 1(c)). Both outpatients and inpatients/year were significantly lower for ASD training in GEN versus CAP programs ($U_{Out} = 353, p < 0.001; U_{In} = 410, p = 0.003$).

For ID training in GEN programs, 71% of PDs indicated 1–3 lecture hours/year and 13% indicated no lecture hours (Figure 1(d)). In contrast to ASD training, lecture hours in ID

did not significantly differ between general and CAP programs ($U_{ID} = 582, p = 0.15$). Regarding outpatient training, 42% of GEN PDs reported that their residents saw 1–5 outpatients/year. An additional 16% reported no ID outpatients and 19% reported >30 outpatients/year (Figure 1(e)). For inpatients, 32% of GEN PDs reported that residents saw 1–5 inpatients/year (32%), with the next most common number being 6–10 cases (26%) (Figure 1(f)). Ten percent reported no inpatients with ID, while at the positive extreme, 16% reported >30 inpatients/year. Neither the number of outpatients nor inpatients seen for ID differed between GEN and CAP programs ($U_{Out} = 603, p = 0.37; U_{In} = 651, p = 0.86$).

Program director perceptions of curriculum topics and resident competence

Table 2 shows PD ratings of the importance of core educational topics in ASD/ID, with ratings of 1 indicating "not important" and ratings of 5 indicating "highly important." On average, CAP PD ratings were above 4 for all seven topics, while GEN PDs rated three of seven topics over 4. All CAP PD ratings were significantly greater than GEN PD ratings. Assessment, comorbidity, and psychopharmacology exhibited the strongest ratings for both CAP and GEN PDs. Genetics and transition planning were rated lowest among CAP PDs, whereas genetics and Individualized Education Programs were rated lowest for general PDs.

Table 3 presents mean PD ratings of resident knowledge, interest, and comfort in relation to patients with ASD/ID, where the lowest value was 1 and the highest value was 5. On average, CAP PDs rated residents as having knowledge scores in the neutral range (i.e. >3 and <4). Comorbidity was the one area with a mean rating above 4. Comorbidity also received the highest rating for GEN residents. According to both CAP and GEN PDs, residents were most knowledgeable in assessment, comorbidity, and psychopharmacology, the educational topics which also showed the highest mean ratings for importance. CAP and GEN residents were rated as least knowledgeable in genetics and transition planning, with GEN

Table 3. Program director perceptions of resident knowledge, comfort, and interest.

	CAP (<i>n</i> =45)	GEN (<i>n</i> =31)	Statistics	Effect size (Cohen's <i>d</i>)
Knowledge				
Assessment	3.93 (0.75)	3.00 (0.97)	$t(74)=4.73, p<0.001$	$d=1.11$
Comorbidity	4.09 (0.76)	3.52 (1.00)	$t(53)=2.70, p=0.009$	$d=0.66$
Psychopharmacology	3.96 (0.77)	3.16 (0.90)	$t(74)=4.14, p<0.001$	$d=0.97$
Behavioral interventions	3.50 (0.82)	2.65 (1.05)	$t(73)=3.95, p<0.001$	$d=0.93$
Genetics	3.07 (0.81)	2.42 (0.99)	$t(74)=3.12, p=0.003$	$d=0.73$
Individualized Education Programs	3.60 (0.89)	2.42 (0.89)	$t(74)=5.70, p<0.001$	$d=1.33$
Transition planning	3.00 (0.91)	2.30 (1.02)	$t(73)=3.12, p=0.003$	$d=0.74$
Comfort				
Assessing/managing ASD	3.93 (0.84)	3.00 (1.03)	$t(55)=-4.18, p<0.001$	$d=-1.01$
Assessing/managing ID	3.64 (0.96)	3.03 (1.20)	$t(74)=-2.47, p=0.016$	$d=-0.58$
Interest				
Level of Interest	3.58 (0.92)	2.84 (0.86)	$t(74)=-3.54, p<0.001$	$d=-0.83$
% of residents by program with career interest in ASD/ID	27.36 (29.45)	10.54 (11.65)	$t(58)=-3.39, p<0.001$	$d=-0.71$

CAP: child and adolescent psychiatry; GEN: general psychiatry; ASD: autism spectrum disorder; ID: intellectual disability.

Effect sizes represent comparisons of child and adolescent psychiatry (CAP) to general psychiatry (GEN) programs. Positive effect sizes indicate higher values for CAP programs. Effect sizes of 0.2 are small, 0.5 are medium, and ≥ 0.8 are large. Knowledge scale: 1 = no knowledge, 5 = advanced knowledge. Interest scale: 1 = not interested at all, 5 = very interested. Comfort scale: 1 = very uncomfortable, 5 = very comfortable.

PDs also indicating similarly low resident knowledge in Individualized Education Programs.

When comparing resident competence measures between child and general programs, mean knowledge ratings for CAP residents were greater than those for GEN residents across all topics, with moderate to large effect sizes. Similarly, CAP PDs reported greater mean resident comfort and interest in working with individuals with ASD/ID than GEN PDs. Comfort ratings spanned the neutral range (i.e. >3 and <4) for both CAP and GEN residents, while interest ratings were in the neutral range for CAP residents and lower range (<3) for GEN residents. In terms of the percent of trainees interested in careers involving ASD/ID, on average, CAP PDs reported that 27% of residents within their programs displayed this interest; GEN programs reported a lower value of 11% of residents ($p<0.001$).

Positive associations were found between the amount of training experiences in ASD and ID (both in terms of lectures and patients seen) and the level of resident knowledge, comfort, and interest in working with patients with ASD/ID (see Supplemental Table 2). Significant correlations were moderate to strong ($\rho=0.31-0.59$) and were similar across distinct training experiences in ASD and ID. The number of lecture hours and outpatients were the training experiences most consistently associated with these aspects of trainee competence, in particular, resident comfort.

Program director needs

Ninety-seven percent of CAP and GEN PDs identified resources that would facilitate training in their programs.

Among the choices offered, online video materials in ASD/ID (78%) and case vignettes (72%) were most common, followed by reference/reading lists (57%), live lectures (47%), online courses (45%), and conferences (44%).

Discussion

Findings from this study show that the extent of CAP training in ASD/ID has largely remained unchanged since 2009 and continues to be insufficient. GEN training in ASD is more limited than CAP training (i.e. fewer lecture hours and patients seen), and both programs reported similarly low training experiences for patients with ID. While both CAP and GEN programs showed variation in the level of training experiences across programs, including some programs with relatively high lecture hours and patient numbers, many programs occupied the lower end of the reported range.

Among CAP programs, the most frequently reported number of lecture hours/year remained the same as in 2009 for both ASD and ID. CAP PDs reported that their residents saw a slightly increased number of patients with ASD; however, patient numbers did not change for ID. Overall, the observed gaps in CAP and GEN training are concerning, since skilled psychiatrists are needed to work with both children and adults with ASD/ID, given persistently elevated psychiatric comorbidity (Lever & Geurts, 2016), sensitivity to medication side effects (Charlot et al., 2020), and, for ASD, the challenge of delayed diagnosis (Fusar-Poli et al., 2022). Deficits in ASD/ID training may lead graduating psychiatry residents to feel inadequately

prepared and poorly motivated to routinely treat these patients (Werner et al., 2013).

The data on PD perceptions revealed several important findings. First, we found that PDs recognize the importance of various educational topics in ASD/ID, as demonstrated by CAP PDs rating all seven educational topics as important and GEN PDs rating topics directly pertaining to psychiatric care as important (e.g. assessment, comorbidity, psychopharmacology). GEN PDs' lower ratings of topics entailing multidisciplinary or educational interventions common in childhood were unsurprising, given that general psychiatrists are more likely to work with adult populations. Second, CAP residents were reported to have higher levels of knowledge, comfort, and interest compared to GEN residents. These ratings were in the neutral range for both program types, suggesting the need for improvement. Both types of PDs indicated that their residents have less knowledge in genetics and transition planning for ASD/ID, with GEN residents receiving relatively low scores (<3) in these areas. Although these topics are more specialized, both are relevant due to high rates of genetic abnormalities in ASD/ID (Muhle et al., 2017), and the significant mental health issues that can arise during the transition period, which extends through early adulthood (Gwynette et al., 2021). Finally, we found that the amount of lecture hours and patients seen were positively correlated with resident knowledge, comfort, and interest in ASD/ID. This finding is consistent with prior educational intervention studies (Hine et al., 2021; Major et al., 2013; Reinblatt et al., 2004), which have found that residents who received enhanced training in ASD and/or ID felt more competent and prepared to work with this population in the future. Although our data do not address causality, they suggest that the amount of psychiatry training in ASD/ID could shape the number of future psychiatrists serving these populations and help to alleviate long-running disparities in mental health care (Maddox et al., 2020; Malik-Soni et al., 2022; McBain et al., 2020; Whittle et al., 2018).

We acknowledge that PDs may face many challenges in developing robust training experiences in ASD/ID. One major barrier is the small number of faculty experts in ASD/ID in both GEN and CAP training programs, which is expected to impede clinical supervision and didactics. In addition, educational guidelines for ASD/ID from the American College of Graduate Medical Education (Accreditation Council for Graduate Medical Education, 2020a, 2020b) are nonspecific. Requirements for an "organized teaching and clinical experience" in developmental disabilities are noted for child psychiatry, though criteria for competency are absent, and no requirements are specified for GEN programs. More formal guidance and explicit acknowledgment of a lifespan perspective for these conditions may be important to stimulate program-level efforts to incorporate additional training.

As in 2009, most CAP and GEN PDs indicated that resources would be helpful to enhance training in ASD/ID in their programs, with the most common selections being online videos, followed by vignettes, references/reading lists, live lectures, online courses, and conferences. In response to this need, the Training and Education Working Group for the AACAP Autism and Intellectual Disability Committee developed a set of videos for psychiatry residents on foundational topics in ASD/ID (Gwynette et al., 2022), as listed in Supplemental Table 3. These videos are freely accessible on the committee's website (https://www.aacap.org/AACAP/Member_Resources/ASD-ID/training_education/videos.aspx). The website also includes recommended reading lists in ASD/ID and information on advanced training programs in ASD/ID, such as subspecialty training in developmental neuropsychiatry. These resources focus on generalizable fundamentals of diagnostic presentation and evidence-based management relevant for a broad psychiatry audience, including international trainees or practicing psychiatrists seeking an overview or refresher on these topics. We recognize that feasibility of training interventions will differ across programs, and these curriculum materials are designed to offer a versatile option to supplement training in programs in need of faculty experts. As these and other online resources become increasingly available (e.g. Strickland et al., 2020), PDs are in a better position to support and engage interested trainees in the field of ASD/ID. In addition, options for bolstering practice-oriented training experiences include offering resident rotations in settings serving individuals with ASD/ID (e.g. special education classrooms or residential placements) or with specialists such as developmental behavioral pediatricians, behavioral psychologists, and speech language pathologists. Some states have multidisciplinary ECHO programs (Extension of Community Healthcare Outcomes; Agency for Healthcare Research and Quality) in developmental disabilities, which offer biweekly virtual meetings featuring a didactic presentation and case discussion by experts across disciplines and are generally open at no cost to residents.

Notably, literature from other countries demonstrates that insufficient training of psychiatrists in the care of patients with ASD/ID is a global concern, particularly given a pervasive shortage of psychiatrists, with many low-income and middle-income countries having one psychiatrist for every 200,000 people (World Health Organization [WHO], 2013). Recent reviews of training standards in ID for psychiatrists in the European Union (Dias et al., 2020) and overall psychiatry training in Asia (Isaac et al., 2018) have identified multiple training deficits, including wide variance in the rigor and availability of training, with no required ID training in some countries, a lack of unified minimum training standards, a mismatch between the prevalence of a condition and the amount of training, and limited trainee supervision. These disparities

were noted to compromise the quality of psychiatric care by contributing to inconsistent and fragmentary treatment across the lifespan. In countries throughout North America, Europe, and Asia, as well as Australia, training deficits have been corroborated by psychiatrists themselves (Edwards et al., 2007; Kaushal et al., 2018; Lunskey et al., 2007; Sajith et al., 2019; Werner et al., 2013), and system-level challenges entailing early identification of these patients and the availability of educational resources have also been reported in Brazil and South Africa (Adnams, 2010; Bordini et al., 2015).

The growing worldwide recognition of training deficits in the mental health care of individuals with ASD/ID has culminated in the articulation of recommendations across the international medical community, which complement and extend the training needs noted by participants in our survey. These include efforts to improve the quality of training via systematic, harmonized residency training standards, the provision of specialty training pathways in developmental disabilities, considerations of care across the lifespan, faculty development of experts in these populations, and strategies to enhance the knowledge of practicing psychiatrists, including continuing medical education materials and integration of psychiatrists in multidisciplinary treatment teams. Collaboration with the community of patients and stakeholders to develop training videos of patient cases has also been advocated to provide resources supporting experiential learning, with the additional benefit of empowering patients to contribute to the advancement of mental health care (Ghaderi & Watson, 2019). These proposals are aligned with resource planning aims of the World Health Organization's Mental Health Action Plan (WHO, 2013), which recommends introducing mental health topics into undergraduate and graduate curricula and mentoring health workers in the field to attain global, evidence-based, culturally responsive, and coordinated systems of mental health care.

This study has several limitations. The response rate was low (34% for CAP PDs and 13% for GEN PDs), which could reflect non-response bias and reduce generalizability, although the range of responses suggests variation was represented across programs. Furthermore, the CAP PD response rate is consistent with expected rates for online surveys (Cunningham et al., 2015; Sheehan, 2001) and the prior 2009 survey (Marrus et al., 2014), while more GEN PDs responded for this study than the survey in 2009. Although PDs are appropriate reporters given their involvement in education and evaluation of residents, their investment in training activities could influence their responses. In future work, surveying residents directly about their experiences and perceived competence in conjunction with PDs would provide important complementary information regarding resident competency. Finally, the survey assessed psychiatry training metrics specific to the United States, although as noted above, the finding of

deficits in ASD/ID training has been observed worldwide. Continuing to characterize training in other countries would provide valuable opportunities to advance awareness, advocacy, international collaboration, and more generalizable efforts to promote appropriate mental health care in these populations.

Conclusion

Psychiatry training in ASD/ID continues to be insufficient in many CAP and GEN programs. Deficits in training may be associated with diminished future interest in serving these patients, perpetuating significant barriers to mental health care in ASD/ID. PDs need educational resources to help them strengthen training and engage the next generation of psychiatrists to serve this growing, underserved population.

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Ethical approval

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Supplemental material

Supplemental material for this article is available online.

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