



# A Scoping Review of Peer Mentoring Programs for Autistic College Students

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## Abstract

Many autistic college students struggle with academics, mental health, and career development. Despite a proliferation of peer mentoring programs, there is little consensus as to what approaches are effective and even less published data on the impact of such programs on student outcomes. The purpose of this review is to describe peer mentoring programs for autistic college students and understand whether they are improving outcomes. The search identified 21 articles, with half reporting student outcomes data. Most programs provided weekly one-on-one mentoring individualized to student needs and offered additional supports (e.g., social skills group). Among them, three tracked academic outcomes, three reported non-academic outcomes, and one followed both academic and non-academic outcomes.

**Keywords** Autism · Neurodiversity · College · Higher education · Peer mentoring · Support program

The prevalence of autism continues to rise dramatically in the past 30 years. About 0.7–1.9% of students in the US institutions of higher education are on the autism spectrum (Maenner et al., 2020; White et al., 2011). About one-third of autistic students who completed higher school attend institutions of higher education (Shattuck et al., 2012). In Australia, autistic students that halted post-secondary education often reported unmet social (84%) and behavioral (83%) needs in addition to learning needs (73%) that had not been adequately supported (Autism Spectrum Australia, 2013). For autistic individuals who graduate from college, challenges continue to emerge. In the USA and Australia, after graduation from college, only a third to a half of young autistic adults are employed compared to 79% of those with a learning disability (LD) (Autism Spectrum Australia, 2013; Newman et al., 2011). In the United Kingdom, unemployment for autistic college graduates (18.5%) is more than double the unemployment of disabled college graduates

generally (7.7%) and more than triple that of non-disabled graduates (Equality Challenge Unit, 2015). Autistic college graduates worked full time at nearly half the rate of non-disabled individuals (Equality Challenge Unit, 2015). In the USA and Australia, only about 20% of young autistic adults worked full time compared to 40% of those with intellectual disability (ID) and while 73% of young adults with learning disability (LD) worked full time, 29% of employed autistic adults worked fewer than 15 h weekly (Autism Spectrum Australia, 2013; Roux et al., 2013). These problems suggest that college education has not adequately prepared many autistic college students on preparing for seeking and sustaining employment after graduation.

In addition to challenges in graduating from college and sustaining employment after graduation, co-occurring mental health conditions are a major concern in the neurodiverse population with autistic students reporting mental health conditions more than three times the rate of non-autistic students (Gurbuz et al., 2019). The prevalence of depression, generalized anxiety disorder, social anxiety disorder, and obsessive-compulsive disorder in autistic students were 4–11 times higher than in the general population (Jackson et al., 2018). An estimated 54–71% of autistic adults have at least one other psychiatric diagnosis, most commonly mood and anxiety disorders (Autism Spectrum Australia, 2013; Gurbuz et al., 2019; Jackson et al., 2018; Sobanski et al., 2007). These mental

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health conditions often have severe impacts on social and academic functioning (Gurbuz et al., 2019) with three-quarters of autistic students experiencing suicidal behavior (either ideation, plan, and/or attempt) in their lifetime (Jackson et al., 2018). Autistic adults are more likely to score above the clinical cut-off for suicide risk on a screening tool (72% vs. 33%) and experience heightened levels of non-suicidal self-injury (65% vs. 30%) compared to the general population (Cassidy et al., 2018). Additionally, the co-morbidity of autism with ID was found to associate with a greater vulnerability to anxiety, schizophrenia, eating disorders, and impulse control disorder (Cervantes & Matson, 2015).

To address the above issues faced by autistic college students, some institutions have developed specialized autism support programs, which provide non-academic supports, such as employment preparation, life and social skills instruction, residential accommodations, peer mentoring, social activities, social skills groups, and individual therapy (Barnhill, 2016). This article will focus on peer mentoring programs. Peer mentoring is a practical strategy that can refer to a number of different types of supportive relationships between a junior and a more senior individual. In post-secondary settings, peer mentoring often involves the support and guidance of first-year students from more experienced students to help new students adapt to the environment. Peer mentoring has benefitted mentees by creating structure, support, motivation, and competence and is used to reduce attrition and stress during the transition (Husband & Jacobs, 2009). For autistic students, the intent of peer mentor programs frequently is to aid in the transition to post-secondary environments and to provide social, emotional, and life skills support that is not typically a part of student services (Ames et al., 2016a, 2016b). Peer mentor programs for autistic students frequently include individualized and structured interactions between mentors and similar-aged mentees that range in time, most commonly, weekly, and biweekly individual meetings.

Research highlights the poorer academic, physical, mental health, and employment outcomes for autistic students. To change the course of these poor outcomes, autistic students need more than only accommodations. To augment the accommodations and support services, over the past 20 years, a proliferation of peer mentoring programs has targeted one or more of the above outcomes. As more mentoring programs are described in the literature, it is imperative that we understand the level of evidence for the effectiveness of these programs. Therefore, the present study is designed to fill this knowledge gap by conducting a scoping review of the literature describing peer mentoring programs for autistic college students. This review will outline current practices in peer mentoring programs and describe the efficacy of these programs for autistic students.

## Methods

### Research Questions

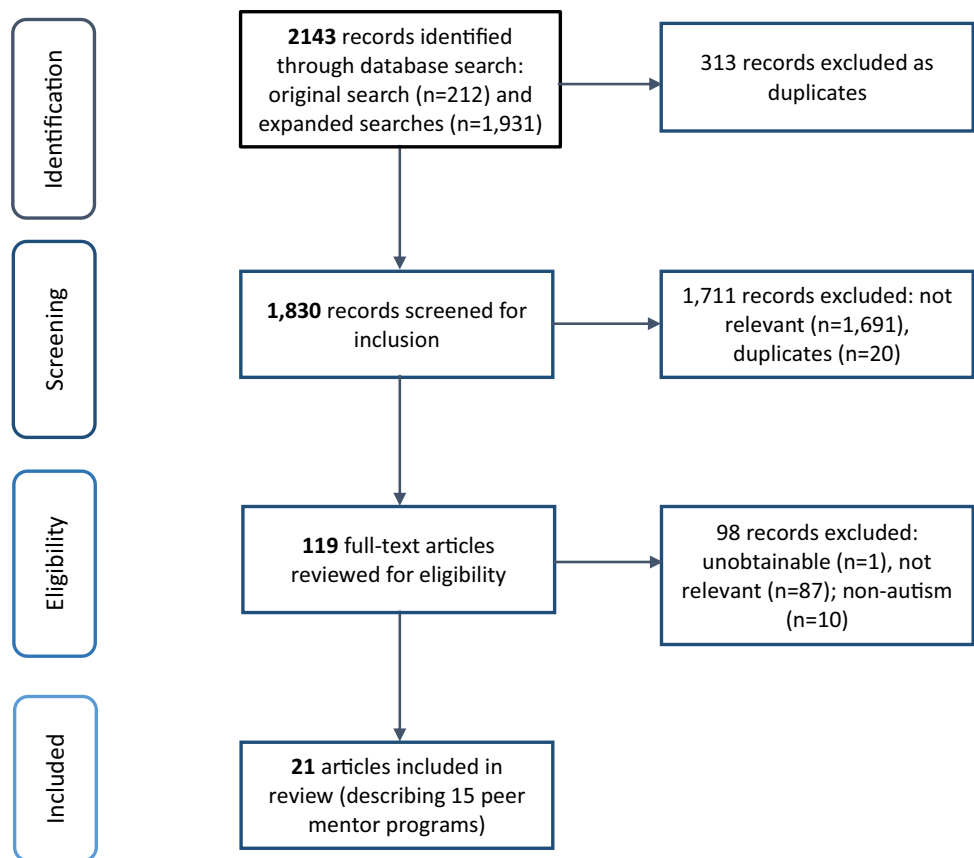
The questions guiding this scoping review were “what are peer mentor programs doing?” and “does research suggest peer mentoring programs improve outcomes?” with two sub-goals: programmatic and research evidence. At the programmatic level, the goal was to summarize the current landscape of peer mentoring programs for autistic students in terms of program structure. At the research level, we sought to understand what academic and non-academic student outcomes were reported from those programs and whether these programs resulted in improved academic and non-academic outcomes in autistic college students.

### Data Sources and Search Strategy

The initial search took place in October 2020 in four electronic databases: ERIC, PsycInfo, Scopus, and Web of Science with an expanded search of the same databases at a later date. Additional searches of the Think College Institute for Community Inclusion, UMass Boston database, were performed in December 2021; searches in Google Scholar were completed in December 2021 and January 2022. These databases were chosen to reflect the heterogeneity of approaches and wide-ranging disciplines involved in supporting autistic students, including education, psychology and psychiatry, social work, occupational therapy, and vocational rehabilitation. The expanded searches of databases Think College and Google Scholar were conducted as a result of the wide range of publications that publish higher education research. Because Google Scholar collates results from across the internet, it can be a powerful addition to traditional database searches (Haddaway et al., 2015). Terms were specific to setting (i.e., college, university, or post-secondary), population (i.e., autism), and program (i.e., mentoring or peer mentoring). Results were limited to journal articles published in English after 1995 due to the proliferation of student support programs in the last twenty-five years (see Supplementary information for exact search strings). Figure 1 illustrates the study selection process.

### Eligibility Criteria

Eligibility was determined in two parts to match the research questions. Papers were deemed eligible for inclusion at the programmatic level if they described a college peer mentoring program for autistic students and met the

**Fig. 1** Adapted PRISMA flow-chart of study selection process

limitations regarding language, date, and type. Practice briefs, review articles, or similar formats not describing a single program were excluded. “College peer mentoring programs for autistic students” were defined as follows:

- college: degree-seeking students at the undergraduate or graduate level, enrolled in a traditional college or university, either part or fulltime
- peer mentoring
- mentoring: meetings with non-professional individuals outside of a clinical setting; focus may be academic, social, executive functioning, independent living skills, and career preparation.
- peer: students at either the undergraduate or graduate level studying at the same college or university; graduate students in clinical programs may be included; post-doctoral scholars, clinicians, professors, advisors, or outside professionals are not considered peers. Graduate students, while at a different level of education than undergraduates, were included as fitting the peer description of more experienced students providing mentorship.
- autistic students: students with a diagnosis of an autism spectrum disorder (ASD; including Asperger’s and pervasive developmental disorder – not otherwise specified (PDD-NOS)) or an educational classification of autism;

programs designed for autistic students that accepted students without a formal diagnosis or verification of diagnosis were still eligible for inclusion

### Screening of Articles

Search results from each database were exported and compiled into a single Microsoft Excel workbook. A separate sheet was used for each phase of the review (deduplication, title screening, abstract screening, and full-text review). Titles and abstracts were screened for potential relevance by the first and second authors in accordance with the definitions above. Citations that were deemed irrelevant had the exclusion reason(s) noted.

### Characterization of Peer-reviewed Articles

Upon full-text review, study and program characteristics were recorded in a spreadsheet. Any program that no longer met inclusion criteria (e.g., program did not include peer mentoring) did not have data charted and instead had the exclusion reason noted on the full-text review sheet. For the papers reporting student outcomes, the level of evidence provided was assessed using the framework developed by the Scottish Intercollegiate Guidelines Network, which assigns

ratings from 1++ (highest quality evidence) to 4 (Harbour & Miller, 2001). A rating of 1 is awarded to evidence from meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs. Evidence from case-control and cohort studies earns a rating of 2. A rating of 3 corresponds to evidence from “non-analytic studies, e.g., case reports, case series,” while expert opinion is rated 4. Further distinctions for ratings 1 and 2 are designated with ++, +, or – depending on the risk of bias, confounds, and the probability that the relationship is not causal (Harbour & Miller, 2001).

## Data Summary and Synthesis

Due to the small number of papers that remained eligible after full-text review, descriptive statistics were calculated within Excel and data was coded and summarized using pivot tables.

## Results

### Search and Selection of Papers

An initial search in October 2020 returned 212 results, and an expanded search of the same databases returned 627 results for a total of 839 potentially relevant citations (Fig. 1). A second search in December 2021 and January 2022 of two additional databases returned a total of 1304 additional relevant citations. Deduplication of the initial search excluded 282 articles leaving a combined 557 to be screened for relevance. Deduplication of the expanded searches in December 2021 and January 2022 excluded 31 articles, leaving 1273 to be screened for relevance. In the initial search, a full-text review of 62 articles yielded 15 articles eligible for inclusion. Full-text review of an additional 57 articles in the expanded searches yielded 7 articles eligible for inclusion. In total, twenty-one papers were included at the programmatic and/or research levels.

### Characterization of Papers

The 21 articles in this review describe 15 unique programs and represent a heterogeneous sample of both study and program design. Detailed program characteristics are reported in Table 1. Of the 15 peer mentor programs discussed here, 13 programs reported student outcomes data of any kind in at least one paper. Of note, two of the thirteen programs reporting student outcomes reported mentor outcomes, leaving 11 programs that reported outcomes data for students with autism receiving mentoring (Ryan et al., 2017; Todd et al., 2019). The majority of programs (12/15) were described in a single eligible paper, two programs were

described in two papers, and one program, the Curtin Specialist Peer Mentor Program, was described in five papers eligible for inclusion in this review (Hamilton et al., 2016; Siew et al., 2017; Thompson et al., 2018, 2020, 2021).

### Program Characteristics: What are Peer Mentor Programs Doing?

**Mentees** While this review includes peer mentoring programs serving autistic college students, requirements for diagnosis documentation varied by program. Of the 9 programs that specified diagnostic requirements for participation, seven (7/9) required that students be receiving services or accommodations through the school’s disability office to be eligible to participate in the program. On the one hand, one program, in addition to requiring students to be registered with the disability office, further confirmed social difficulties through interviews and videotaped conversations (Koegel et al., 2013). On the other hand, one program did not require any documentation and was open to any student who disclosed their autism diagnosis (Ames et al., 2016a, 2016b). Seven programs did not specify the documentation requirements.

**Mentors** Programs were varied on the source of their mentors. Five programs used exclusively undergraduate students as mentors, while seven programs’ mentors were a mix of undergraduate and graduate students. In two programs, only graduate students served as mentors (Ames et al., 2016a, 2016b); one program specified kinesiology students, but did not specify at what level (Todd et al., 2019); one program did not specify the level of peer mentors (Pionke et al., 2019).

**Mentoring Structure and Content** Mentoring typically took place weekly or every other week for one to two hours, although one program took an approach that offered more intensive support for the first year of college and provided up to ten hours of mentoring weekly during which mentors covered key areas the program determined necessary for college success (Rando et al., 2016) and a second program reported that mentoring was provided for an average of 7.5 h per week, which mentors spent in three consistent roles as boundary setter, friend facilitator, and academic tutor (Ryan et al., 2017). In one program, the mentoring frequency was dependent on student needs (Koegel et al., 2013). Mentors in most programs (11/15) provided individualized support that was responsive to the needs of their students, while mentors in four programs followed a standard, structured curriculum. In one program, the amount of peer mentoring support was not specified (Atkinson et al., 2011). The content or focus of mentoring sessions varied across programs, with most programs providing mentoring that targeted a combination

**Table 1** Programmatic characteristics and research findings in peer mentoring programs for autistic students in higher education

Program name	Location	Program description			Mentors	Other components	Authors
		Mentoring structure					
Autism Mentorship Initiative (SFU), CAN	Simon Fraser University (SFU), CAN	weekly, 1–2 h for 2 semesters	Senior undergraduate and graduate students at SFU		Educational workshops and social events	Roberts and Birmingham, 2017	
Autism Mentorship Program (AMP)	York University, CAN	Weekly/biweekly for 1 h	Graduate students in clinical psychology		Group workshops and social events (4/year)	Ames et al., 2016a, 2016b; Ncube et al., 2019	
Buddy Scheme	Sheffield Hallam University, South Yorkshire, England	Buddy relationship with unspecified agreed boundaries	Students unspecified		Unspecified	Atkinson et al., 2011	
Communication Coaching Program (CCP)	University of Rhode Island, USA	Weekly, 1 h for 1–4 semesters; might include campus “field trips”	Undergraduate students		Communication coaches (Speech & Hearing Clinic), social skills group, disability counselors	Weiss & Rohland, 2014; Weiss & Rohland, 2015	
Curtin Specialist Peer Mentor Program (CPMP)	Curtin University, AUS; University of Western Australia, AUS	Weekly, 1–2 h	Undergraduate and graduate students in health sciences		Weekly 90 min social skills group, off-campus outings during breaks	Hamilton et al., 2016; Siew et al., 2017; Thompson et al., 2020	
CPMP and SPMP	Curtin University (CU) in Western Australia and the University of Western Australia (UWA)	Weekly meetings individualized goals	Graduate students from health science programs		None	Thompson et al., 2021	
Into Fitness Together (IFT)	California State University, Northridge, USA	1:1, 2.5 h per week fitness program	Trained kinesiology students (educational level not specified)		None	Todd et al., 2019	
Project Reach	College of Staten Island, USA	Weekly 1–h 1–1 mentor meetings	Undergraduate and graduate students		Group curriculum	Gillespie-Lynch et al., 2017	
Raiders on the Autism Spectrum Excelling (RASE)	Wright State University, USA	Weekly 1–1 meetings, up to 10 h, 2 semesters	Undergraduate and graduate students		Meeting with disability office staff, biweekly support group	Rando et al., 2016	
Students with autism Transitional Education Program (STEP)	Eastern Illinois University, USA	Not stated	Not stated		Group support sessions, required study hours, library involvement	Pionke et al., 2019	
Strategies for College Learning (SCL)	University of New Hampshire, USA	Weekly, 1-h 1–1 meetings w/ researcher supervising for 1–2 semesters	Undergraduate and graduate students in communication sciences		None	Ness, 2013	
N/A	Mississippi State University, USA	Weekly for a meal/activity, 18 weeks	Undergraduate students without a disability		Weekly supervised social activities	Fairchild et al., 2020	
N/A	University of California, Santa Barbara, USA	Assisted with social activity; 13 weeks	Undergraduate and graduate students		Intensive social planning intervention sessions led by a clinician	Ashbaugh et al., 2017	
N/A	University of California, Santa Barbara, USA	Mentors accompanied students to activities upon request, 33 weeks	Undergraduate students		Weekly meetings to plan social events	Koegel et al., 2013	



Table 1 (continued)

Program name	Location	Program description			Authors
		Mentoring structure	Mentors	Other components	
N/A	University of Tennessee	Not stated	Undergraduate and graduate students	None	Farley et al., 2014
N/A	University of Vermont	7.5 h per week for 30 weeks a year	Undergraduate students	None specified	Ryan et al., 2017

AMP, Autism Mentorship Program; CCP, Communication Coaching Program; CPMP, Curtin Specialist Peer Mentor Program; IFIT, Into Fitness Together; N/A, not available; RASE, Raiders on the Autism Spectrum Excelling; SCL, Strategies for College Learning; SPMP, Specialist Peer Mentoring Program; STEP, Students with autism Transitional Education Program

of academic (6/15), social (7/15), and/or self-management/self-determination skills (9/15). Five programs provided general support to students as they transitioned to and navigated college life. Mentoring in one program focused on fitness (Todd et al., 2019).

**Other Components** The majority of programs (10/15) had at least one other component in addition to peer mentoring. Five of those programs provided multiple additional supports. Most commonly, this took the form of educational workshops, skills-building groups, or social events. Other elements included individual meetings with disability counselors or communication coaches, intensive social planning with a clinician, and required study hours.

### Study Characteristics

A description of study characteristics can be found in Table 1.

**Purpose** The articles in this review address a wide range of research questions and objectives. They can, however, be grouped into three main categories: theoretical, program description and evaluation, and program/mentor outcomes, though studies often had multiple objectives. Three studies' primary objective was theoretical in nature: two investigating the mechanisms of action of mentorship, and one applying an ethics framework to evaluate their program. The primary purpose for three studies was program evaluation, another nine studies had the dual goals of program and outcomes evaluation, and for the remaining five papers, the main focus was program outcomes.

**Study Design** Study design and sample size both varied among programs. Most programs opted for a descriptive or quasi-experimental study design. Thirteen papers collected student outcomes data; two papers collected descriptive data on mentor or family outcomes; eight utilized some form of analysis, while seven presented descriptive statistics only. Using the Scottish Intercollegiate Guidelines Network, studies included in this review received a rating of either 2– or 3, indicating their conclusions provide low-to-moderate quality of evidence. A rating of 2 corresponds to evidence from “case–control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal”; a rating of 3 corresponds to evidence from “non-analytic studies, e.g., case reports, case series” (Harbour & Miller, 2001).

*Outcomes Characteristics:* Outcomes reported, like study design, were highly variable. Student outcomes were reported in at least one paper by seven of the nine programs. As with mentoring content, the use of individual outcome

measures differed among programs and were both academic and non-academic. Measures used can be grouped into six general categories: academic, employment, mental health, self-determination, social, and fitness (Table 1). Academic and social outcomes were most reported, with six programs providing data on each (Ashbaugh et al., 2017; Koegel et al., 2013; Ness, 2013; Rando et al., 2016; Weiss & Rohland, 2014, 2015). Mental health (Gillespie-Lynch et al., 2017; Hamilton et al., 2016) and employment (Koegel et al., 2013) outcomes were least frequently noted, each being reported by one program. One program targeted health fitness outcomes (Todd et al., 2019). Three studies, including two programs for students with a diagnosis of ASD and ID, collected outcomes on the mentor experience and did not collect outcome data on the impact of the programs on autistic students (Farley et al., 2014; Hamilton et al., 2016; Ryan et al., 2017). A fourth study collected outcomes on the experiences of parents (Thompson et al., 2021). Detailed aims, measures, and findings are reported in Table 2.

*Findings from Studies with Outcome Measures. Are Peer Mentor Programs Improving Student Outcomes?* This review identified three primary areas of focus for student outcomes: academics, social, and self-determination, with mental health, fitness, and employment as less frequent, secondary areas of focus.

Academic activities are a key aspect of successful integration into post-secondary life for students with ASD (Glennon, 2001). Several peer mentor programs reviewed included mentor content on navigating academic stressors (e.g., managing the workload, group projects, interactions with professors). One program reported statistically significant improvements in academic self-efficacy (Gillespie-Lynch et al., 2017). Five other programs reported academic outcomes, and some of these programs reported positive changes in academic measures, including grade point average (GPA) (Ashbaugh et al., 2017; Koegel et al., 2013; Ness, 2013; Rando et al., 2016; Siew et al., 2017), retention (Rando et al., 2016; Siew et al., 2017), academic status/probation (Ness, 2013), and planning and problem-solving needed for academic activities (Weiss & Rohland, 2015).

Social challenges are core to autism, with challenges in social integration a predictor of withdrawal from post-secondary settings (Kuriyan et al., 2013), justifying the focus on social factors in mentoring curriculum and outcomes. Seven programs used measures to assess social outcomes (Ashbaugh et al., 2017; Fairchild et al., 2020; Gillespie-Lynch et al., 2017; Koegel et al., 2013; Ncube et al., 2019; Siew et al., 2017; Thompson et al., 2020). Four of those programs reported improvements in social outcomes (e.g., increased attendance at social events, improvement in perceived social support, improvement in social support assessment scores) (Ashbaugh et al., 2017; Fairchild et al., 2020; Gillespie-Lynch et al., 2017; Koegel et al., 2013). Two programs did

not report changes in social outcome measures (Ncube et al., 2019; Thompson et al., 2020). One program revealed significant changes associated with participating in the social components of mentoring programs. Siew et al. (2017) reported significant improvements in social support scores, indicating that autistic mentees felt more supported, and a significant reduction in general communication apprehension.

Self-determination is a key factor in the success of autistic students in college (Cobb et al., 2009). Self-determination skills involve “a combination of skills, knowledge, and beliefs that enable a person to engage in goal-directed, self-regulated, autonomous behavior” (Wehmeyer, 1998). We found that students did not show significant improvement on any of the three outcome measures relating to self-determination used by programs in this review, and no self-determination outcome measures were used by multiple programs. The Specialist Peer Mentoring program was found not to result in significant changes in two self-determination-related measures (Generalized Self-Efficacy Scale and Self-Perceived Communication Confidence Scale), while the program was shown to result in improvements in social motivation and social communication (Thompson-Hodgetts et al., 2020). Gillespie-Lynch et al. (2017) found significant increases in academic self-efficacy, and a portion of students reported higher perceived self-advocacy skills. In another study utilizing self-determination-related measures, the acquisition of Self-Regulated Learning skills was measured, but no significant testing was conducted (Ness, 2013).

## Discussion

### What are Peer Mentor Programs Doing?

Overall, the peer mentoring programs for autistic college students identified in this review were highly variable. Yet, they had several structural commonalities. The majority of programs opted for an individualized approach rather than a structured curriculum in mentoring meetings. Similarly, many programs provided general support in navigating college, though some focused specifically on the academic or social aspects. Most included the option of participating in additional supports, such as educational and skills groups or social activities.

### Does Research Suggest Peer Mentoring Programs Improve Outcomes?

In contrast to programs' structures, reported student outcomes were highly heterogeneous. Six programs described academics as a part of their mentoring content and had academic outcomes. Nearly half of all programs reported at least one academic or non-academic (e.g., social,

**Table 2** Programmatic aims, measures, and findings in peer mentoring programs for autistic students in higher education

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
Autism Mentorship Initiative	<ul style="list-style-type: none"> <li>Present a conceptual understanding of how mentorship is experienced by the participants of a mentorship program for university students with autism</li> </ul>	<ul style="list-style-type: none"> <li>Unstructured interview with mentors</li> <li>Semi-structured interviews with mentors and mentees</li> <li>Program evaluation surveys</li> <li>Progress notes and goal setting forms</li> </ul>	<ul style="list-style-type: none"> <li>Five main themes were identified and interrelated under the core theme of a mentee-centered approach: (1) the natural progression of the relationship, (2) the supportive mentor, (3) the meeting process, (4) identifying and implementing goals, and (5) learning together</li> </ul>	N/A	7 males, 2 females with ASD	6 Caucasian, 1 Japanese, 1 Chinese, and 1 Sri Lankan with ASD	9 mentees with ASD	Roberts and Birmingham, 2017
AMP	<ul style="list-style-type: none"> <li>Provide information about a sample of university students with ASD and (b) evaluate satisfaction with the support provided</li> </ul>	<ul style="list-style-type: none"> <li>Demographic information</li> <li>Satisfaction surveys</li> <li>Student feedback questions</li> <li>List of goal topics to endorse</li> <li>retention</li> </ul>	<ul style="list-style-type: none"> <li>Number of students has increased by 200%</li> <li>High levels of satisfaction were reported</li> <li>Self-reported success in achieving personal goals (social skills most frequently endorsed)</li> <li>The program is serving students from a variety of academic disciplines</li> </ul>	2–	15 males, 8 females with ASD	Not specified	23 mentees with ASD	Ames et al., 2016a, 2016b
AMP	<ul style="list-style-type: none"> <li>Describe social support experiences of students with ASD</li> </ul>	<ul style="list-style-type: none"> <li>List of mentoring topics covered</li> <li>Social provisions scale</li> <li>The Cambridge friendship questionnaire</li> <li>Student indication of identified goals</li> <li>Satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>Topics: coursework, social skills were the most endorsed</li> <li>Social and friendship: no significant differences</li> <li>Goals: many students identified social goals</li> <li>Satisfaction: students expressed satisfaction with AMP, individual meetings, and plans to return</li> <li>No significant differences in perceived social support from the beginning to the end of students' first year in the program</li> </ul>	2–	18 males, 5 females with ASD	8 European-Canadian, 3 Asian-Canadian, 1 African-Caribbean-Canadian with ASD; 11 did not provide information	23 mentees with ASD	Neube et al., 2019
Buddy Scheme	<ul style="list-style-type: none"> <li>Explore aspects of social interaction for people with the label of Asperger Syndrome and present preliminary evaluations of a small scale "Buddy Scheme"</li> </ul>	<ul style="list-style-type: none"> <li>Retention</li> <li>Questionnaire</li> </ul>	<ul style="list-style-type: none"> <li>Three buddy relationships were successfully maintained during the period of the scheme</li> <li>All participants kept within the agreed boundaries</li> <li>Recruitment, training, matching event, and buddy meetings rated as good or very good</li> </ul>	3	Not specified	Not specified	4 mentees with ASD and 4 mentors	Atkinson et al., 2011
CCP	<ul style="list-style-type: none"> <li>Examined an interdisciplinary college-based support program, considering six ethical constructs</li> </ul>	<ul style="list-style-type: none"> <li>Review the CCP's operation in terms of ethical constructs</li> </ul>	<ul style="list-style-type: none"> <li>Program should be further individualized to meet the needs of participants diagnosed with deficits in social communication and executive functioning skills</li> </ul>	N/A	N/A	N/A	N/A	Weiss & Rohland, 2014;



Table 2 (continued)

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
CCP	<ul style="list-style-type: none"> <li>Describe the operation of a communication coaching program, which was designed to provide support for autistic students</li> </ul>	<ul style="list-style-type: none"> <li>Participation, retention, and completion outcomes</li> <li>Student feedback</li> </ul>	<ul style="list-style-type: none"> <li>42% of the students with ASDs known to the disability services office have participated in the CCP</li> <li>The average number of participating semesters has been 2, and generally fall and spring semesters freshman year</li> <li>None of the students were dismissed from the university</li> <li>Students reported: ability to keep a weekly schedule and assignments; learned making reasonable goals; more confident in conversations, knowledge of relate to others in a group and to attend to own tone of voice</li> </ul>	3	15 males and 8 females with ASD	Not specified	Data review of 23 mentees with ASD	Weiss & Rohland, 2015
CPMP	<ul style="list-style-type: none"> <li>Understand the impact of peer mentor training on seven student mentors working with university students with an ASD</li> </ul>	<ul style="list-style-type: none"> <li>Participant satisfaction: purpose-designed satisfaction questionnaire</li> <li>Participant learning: pre-test, post-test training questionnaire</li> <li>Application of knowledge: semi-structured interviews</li> </ul>	<ul style="list-style-type: none"> <li>Average a 29% increase in their ASD knowledge following the training</li> <li>Training had been essential to their role</li> <li>Overall experience had been positive</li> <li>Training and support were pivotal to success as peer mentors</li> </ul>	N/A	1 male and 6 females with ASD	Not specified	7 mentees with ASD	Hamilton et al., 2016
CPMP	<ul style="list-style-type: none"> <li>Evaluate the pilot year of the Curtin Specialist Mentoring Program (CSMP)</li> </ul>	<ul style="list-style-type: none"> <li>AMAS-C</li> <li>SPS</li> <li>SCAM</li> <li>SPCC</li> <li>PRCA-24</li> <li>Student satisfaction survey</li> </ul>	<ul style="list-style-type: none"> <li>No significant pre-post change in overall anxiety scores (AMAS-C), state communication apprehension (SCAM), or participants' perceived communication competence (SPCC)</li> <li>Significant pre-post improvement in social support scores (SPS), indicating participants felt more supported</li> <li>Significant pre-post reduction in general communication apprehension was also found (PRCA)</li> <li>Academic performance: participants also achieved distinction (70 ± 79) or high distinction (80+) for 62.9% of units taken, with a failure rate of 2.9%</li> <li>All study participants re-enrolled in semester</li> <li>Positive features of CPMP: (a) provision of constant, stable support, (b) comfort of peer-to-peer support, and (c) flexible and individualized support</li> </ul>	2-	7 males and 3 females with ASD	Not specified	10 mentees with ASD	Stew et al., 2017

Table 2 (continued)

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
CPMP	<ul style="list-style-type: none"> <li>• Explore the required contexts, mechanisms, and outcomes of peer mentoring for university students with ASD</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-structured interviews based on a realist evaluation framework</li> </ul>	<ul style="list-style-type: none"> <li>• Thematic analysis identified three context themes: “environmental conditions,” “university course demands,” and “aspects of ASD”</li> <li>• Four mechanism themes: “mentor,” “communication and social interaction,” “problem-solving,” and “training and supervision”</li> <li>• Five outcome themes: “identifying personal strengths,” “increased autonomy,” “achieving goals,” “relationships,” and “positive mentor outcomes”</li> </ul>	2	17 males and 6 females with ASD	Not specified	23 autistic mentees and 24 mentors	Thompson et al., 2018
CPMP and SPMP	<ul style="list-style-type: none"> <li>• Explore the experiences of undergraduate autistic university students to identify active ingredients in the peer mentoring process and to examine the impact of SPMP on social communication</li> </ul>	<ul style="list-style-type: none"> <li>• AMAS-C</li> <li>• GSE</li> <li>• PRCA</li> <li>• SCAM</li> <li>• SPCC</li> <li>• SPS</li> <li>• SRS-2</li> <li>• Semi-structured interviews to explore expectations, experiences, and outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Significant decrease in autistic trait behaviors on the total SRS-2</li> <li>• Differences between time-point 1 and time-point 2 on all remaining sub-scales were non-significant</li> <li>• Four themes emerged from the interviews: developing partnership and understanding, modeling and practicing communication, psychological support, and grading and planning skills</li> <li>• Mentor-mentee partnership was a crucial active ingredient of SPMP</li> </ul>	2–	22 males and 8 females with ASD	Not specified	30 autistic mentees	Thompson et al., 2020
CPMP and SPMP	<ul style="list-style-type: none"> <li>• To explore the experiences of parents of specialist peer mentored university students and to examine these using the ICF as a theoretical framework</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-structured interviews</li> <li>• Activity and participation</li> <li>• Environmental factors</li> <li>• ICF core set for ASD</li> </ul>	<ul style="list-style-type: none"> <li>• Five interrelated themes emerged: The mentoring relationship is a facilitator; developing skills for university; mentoring changes lives; mentoring is not a substitute for other supports; and university is an emotional rollercoaster</li> </ul>	2	N/A	N/A	13 parents of autistic mentees	Thompson et al., 2021
IFIT	<ul style="list-style-type: none"> <li>• To learn whether the IFIT program had the potential to increase health-related fitness and how autistic college students experienced IFIT</li> </ul>	<ul style="list-style-type: none"> <li>• Anthropometric and fitness data before and after the intervention</li> <li>• Individual interviews about their IFIT experience</li> </ul>	<ul style="list-style-type: none"> <li>• Improved cardiorespiratory fitness, flexibility, and upper body muscular endurance</li> <li>• Gains in motor competence and knowledge of exercise, improved overall health, increased sense of belonging</li> </ul>	2	13 males and 3 females with ASD	10 White, 3 Asian, 1 White/Asian, 2 Hispanic with ASD	16 autistic mentees	Todd et al., 2019

Table 2 (continued)

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
Project Reach	<ul style="list-style-type: none"> <li>Evaluate two semesters of mentor-led group programming for autistic college students and students with other disabilities</li> </ul>	<ul style="list-style-type: none"> <li>Needs assessments of perceived importance of guidance on 39 skills</li> <li>SRS-2</li> <li>Spielberger State-Trait Anxiety Inventory</li> <li>Student self-report of academic self-efficacy</li> <li>Self-advocacy inventory</li> <li>Open-ended self-advocacy definitions</li> <li>Focus groups and end of term written evaluations: open-ended reflections about the supports</li> </ul>	<ul style="list-style-type: none"> <li>Participation in social skills groups was associated with decreased anxiety and autism symptoms (semester 1)</li> <li>Participation in self-advocacy groups was associated with increased perceived social support from friends, academic self-efficacy, and more accurate definitions of self-advocacy (semester 2)</li> </ul>	2	19 males and 11 females with ASD	22 White, 6 Hispanic, 1 Black, and 1 Mixed-Ethnicity with ASD	30 autistic mentees	Gillespie-Lynch et al., 2017
RASE	<ul style="list-style-type: none"> <li>Description of program and observed outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction survey</li> <li>GPA</li> <li>Retention</li> <li>Behavioral incidence (school expulsions, phone calls, and inquiries to ODS regarding student issues, positive police, and faculty consultation with ODS)</li> </ul>	<ul style="list-style-type: none"> <li>Increase in student GPA over two semesters, a decrease in behavioral violations, and high levels of satisfaction with the program from both the students and the transition coaches</li> </ul>	3	Not specified	Not specified	11 autistic mentees	Rando et al., 2016
STEP	<ul style="list-style-type: none"> <li>Case study to understand how an integrated assistance program like the STEP works and understand how the library plays a role in such a program by asking the participants</li> </ul>	<ul style="list-style-type: none"> <li>Structured interview script on experiences and impressions of the library were needed</li> </ul>	<ul style="list-style-type: none"> <li>Students viewed the library as a haven and place for quiet study</li> <li>Collected feedback for improvement to make libraries more welcoming to people with autism</li> </ul>	N/A	6 males and 1 female with ASD	Not specified	7 autistic mentees	Pronke et al., 2019
SCL	<ul style="list-style-type: none"> <li>To pilot SCL, exploring changes in SRL strategies and course grades for three students with Asperger syndrome, and assess the perceived acceptability of the intervention package</li> </ul>	<ul style="list-style-type: none"> <li>Changes in cumulative GPA and course grades</li> <li>Observational data recorded by mentors and video recorded sessions</li> <li>Qualitative semi-structured interview</li> </ul>	<ul style="list-style-type: none"> <li>Data were analyzed using a case studies approach</li> <li>Participants learned strategies relative to individual goals</li> <li>GPA: mixed</li> <li>Post-intervention interviews: students cited improvements in organization, studying, and improved academics</li> <li>Intervention package may have contributed to improved academics and was perceived as a useful, acceptable intervention</li> </ul>	3	2 males and 1 female with ASD	Not specified	3 autistic mentees	Ness, 2013

Table 2 (continued)

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
N/A	<ul style="list-style-type: none"> <li>Examine the effectiveness of a peer mentor program, both alone and combined with an incentive program, on increasing the social engagement of college students with ASD and examine perceptions of students with ASD to determine barriers to participation in social events</li> </ul>	<ul style="list-style-type: none"> <li>Number of social events</li> <li>Survey regarding barriers to social engagement</li> </ul>	<ul style="list-style-type: none"> <li>Peer mentor program alone and peer mentor program plus incentive program, increased students' attendance at social events</li> <li>Time management was identified as a barrier to social activity</li> </ul>	2-	Not specified	Not specified	40 autistic mentees	Fairchild et al., 2020
N/A	<ul style="list-style-type: none"> <li>To assess within the context of a multiple-baseline across participant</li> <li>Design whether a structured social planning intervention would increase social integration for college students with ASD</li> </ul>	<ul style="list-style-type: none"> <li>Number of social and extracurricular activities per week</li> <li>Number of unique peer interactions at social activities</li> <li>GPA</li> <li>Self-report questionnaire of general social and college experience satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>All participants increased their number of community-based social events, extracurricular activities, and peer interactions</li> <li>Improved academic performance (GPA) and satisfaction with college experience</li> </ul>	2	1 male and 2 females with ASD	3 Caucasian with ASD	3 autistic mentees	Ashbaugh et al., 2017
N/A	<ul style="list-style-type: none"> <li>Evaluate the effectiveness of structured social planning for college students with ASD</li> </ul>	<ul style="list-style-type: none"> <li>Activity logs of social events</li> <li>Quality of life: formal and informal social activity; GPA; job positions</li> <li>Satisfaction questionnaires: Likert scale of peer interactions and conversations, number of friends, college experience</li> </ul>	<ul style="list-style-type: none"> <li>Participants were not attending any social events throughout the baseline period</li> <li>All participants increased the number of social events attended per week</li> <li>Quality of life and satisfaction questionnaires: all reported higher satisfaction with college experience and peer interactions</li> <li>Improvements in untargated areas: increases in non-structured social interactions, improvements in grade point averages, and employment</li> </ul>	3	3 males with ASD	2 Caucasian, 1 Hispanic with ASD	3 autistic mentees	Koegel et al., 2013
N/A	<ul style="list-style-type: none"> <li>To examine the effects that student mentoring involvement had on college students involved in a peer mentoring program for students with intellectual disabilities</li> </ul>	<ul style="list-style-type: none"> <li>Open response questions</li> <li>Self-report personality assessment based on the Myers-Briggs typology method</li> </ul>	<ul style="list-style-type: none"> <li>Benefits of mentoring: intrapersonal enrichment and growth, work experience and knowledge, development of friendships, interpersonal skill development</li> <li>Participants represented a wide variety of personality types</li> </ul>	2	4 males, 35 females with ID	31 Caucasian, 3 African American, 3 Hispanic, 2 Asian with ID	39 with ID (4 with co-occurring DD)	Farley et al., 2014

Table 2 (continued)

Program name	Aims	Measures	Findings	Level of evidence <sup>a</sup>	Gender of mentees	Race/ethnicity of mentees	Sample size	Authors
N/A	<ul style="list-style-type: none"> <li>Investigate the experiences and perspectives of university undergraduate students who were peer mentors for students with ID/DD</li> </ul>	<ul style="list-style-type: none"> <li>Semi-structured interviews</li> <li>Peer mentor notes and reflective logs</li> <li>Documents such as peer mentoring manuals and guidelines</li> <li>Focus group members</li> <li>Check debriefing sessions</li> </ul>	<ul style="list-style-type: none"> <li>The roles of these peer mentors</li> <li>The benefits and challenges related to peer mentoring</li> <li>The transformative effect of peer mentoring on these undergraduate students</li> <li>Undergraduate students</li> <li>Consider being a mentor highly meaningful</li> </ul>	2	3 males, 15 females with ID/DD	Not specified	18 with ID/DD	Ryan et al., 2017

AMAS-C, Adult Manifest Anxiety Scale-College; ASD, autism spectrum disorder; AMP, Autism Mentorship Program; CCP, Communication Coaching Program; CPMP, Curtin Specialist Peer Mentor Program; DD, developmental disorder; GPA, grade point average; GSE, Generalized Self-efficacy Scale; ICF, International Classification of Functioning, Disability and Health; ID, intellectual disability; IFIT, Into Fitness Together; N/A, not available; PRCA, Personal Report of Communication Apprehension; RASE, Raiders on the Autism Spectrum Excelling; SCAM, Situational Communication Apprehension Measure; SCL, Strategies for College Learning; SPCC, Self-Perceived Communication Competence Scale; SPMP, Specialist Peer Mentoring Program; SPS, Social Provisions Scale; SRS-2, Social Responsiveness Scale, second edition; STEP, Students with autism Transitional Education Program

<sup>a</sup>Level of evidence according to the Scottish Intercollegiate Guidelines Network (SIGN) framework. A rating of 2 corresponds to evidence from “case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal”; a rating of 3 corresponds to evidence from “non-analytic studies, e.g., case reports, case series” (Harrington & Miller, 2001)

mental health) outcome. While 9/15 programs included mentor content in self-regulation, self-advocacy, and/or self-determination, few programs collected data on self-determination. About half of the programs included social aspects in their mentor content, with seven including some social outcome (e.g., attendance at social events). Mental health and employment outcomes were infrequently measured. Three of the fifteen programs focused on the mentor experience. One program reported the experience of parents and did not report any outcomes for students utilizing the program.

Assessing student outcomes across programs is not possible because the aims of the papers and measures used were mostly different across programs with many papers having multiple aims. Six papers included program description as a primary aim (Ames et al., 2016a, 2016b; Atkinson et al., 2011; Gillespie-Lynch et al., 2017; Thompson et al., 2020; Weiss & Rohland, 2014, 2015). Four papers were aimed at reporting on program satisfaction (Ames et al., 2016a, 2016b; Atkinson et al., 2011; Gillespie-Lynch et al., 2017; Siew et al., 2017), and four had aims to report changes in measures of social support or engagement (Ashbaugh et al., 2017; Fairchild et al., 2020; Ncube et al., 2019; Siew et al., 2017). Other aims included (a) understanding the impact of peer mentorship on mentors (Farley et al., 2014; Hamilton et al., 2016; Ryan et al., 2017), (b) understanding the impact of peer mentorship on parents of autistic mentees (Thompson et al., 2021), (c) examining the conceptual underpinnings of a mentoring program (Roberts & Birmingham, 2017; Thompson et al., 2018; Weiss & Rohland, 2014), (d) exploring the ingredients of the peer mentor process (Thompson et al., 2020), (e) program evaluation (Gillespie-Lynch et al., 2017), and (f) the impact of program participation on health-related fitness (Todd et al., 2019) (Table 2).

Additionally, three of the papers clarified, in their aims, that these were preliminary or pilot explorations (Atkinson et al., 2011; Ness, 2013; Siew et al., 2017). The identification of several programs as preliminary or pilot programs, along with program description as a primary aim for six programs, suggests that implementing and evaluating peer mentor programs for autistic students in post-secondary settings is in the early stages (Table 2).

When we look at measures, we find that while academic performance and retention of autistic students in post-secondary settings were often cited as contributing to the need for a mentor program and academic and retention measures were included as a part of data sets, only one program explicitly aimed at measuring or reporting on the impact of peer mentorship on academics or retention in post-secondary settings (Ness, 2013). More commonly, papers linked academic and retention challenges to social and self-determination factors for autistic students, which was reflected in their aims and measures.



Nearly half of the programs included aims, measures, and findings on social outcomes. This is a surprisingly low proportion, given that social interaction difficulties are the core challenges of the vast majority of autistic individuals. For the programs which had components evaluating social interactions, outcome measures and their outcomes were highly variable. One study used the Social Provision Scale (SPS) which was designed to measure the availability of social support. Another study employed the Self-Perceived Communication Competence Scale (SPCC) which measured self-perceived communication competence. Further exploration is needed on which aspects of social support (e.g., attendance at social events vs. perceived support vs. perceived social competence) are beneficial to post-secondary success for autistic students and how to best measure those social outcomes.

Currently, peer mentoring and self-determination models are generally considered beneficial; however, the papers in this review did not provide additional evidence to determine the efficacy of these interventions. With the Rehabilitation Acts of 1992 and 1998 and the Individuals with Disabilities Education Acts (IDEA) of 1990 and 1997, self-determination became a significant part of transition planning for students with autism. In this legislation, self-determination is centered on the context of providing support to students with disabilities (Getzel, 2014). While self-determination is complex, self-determination outcomes can be enhanced by interventions specifically targeted to them (Cobb et al., 2009). In post-secondary settings, autistic students face additional challenges than their non-disabled peers, including managing accommodations along with coursework, a lack of acceptance, and difficulties accessing necessary services and support (Adams & Proctor, 2010; Rothman et al., 2008). Additionally, autistic students often have less opportunity to develop and practice self-determined behaviors (White et al., 2014). Post-secondary peer mentor programs are uniquely positioned to implement self-determination interventions to help address these challenges.

In addition to the lack of consistent outcome measures in the mentoring programs, the quality of the studies is either low or moderate. There were no randomized controlled trials of any peer mentoring programs. Most studies did not demonstrate statistically significant outcomes, which may be related to their small sample sizes, execution of the studies, variability of delivery of peer mentoring, and variability of training for the peer mentors. Inconsistency in methodological rigor and variation of data collection in the programs reviewed limited our ability to compare the effectiveness of these peer mentor programs in improving student outcomes.

## Diversity in Reported Programs

When we consider our research question, “what are peer mentor programs doing?” we also naturally consider, who are they serving? The geographic locations of the programs in this review include the USA (11/15), Canada (2/15), the United Kingdom (1/15), and Australia (1/15). National cultural values relate to individual behaviors, attitudes, and outcomes (Kirkman et al., 2006). By including a diversity of countries in this review, we gain a broader view of support programs for autistic students. At the same time, the countries represented in this study would all be considered high-income countries. Consequently, this review does not offer insight into other countries with less resources. Additionally, while the present review includes peer mentoring programs from various geographic locations, the program participants were predominantly White male students (see Table 2). We speculate that this lack of student diversity is an indication of a lack of diversity in the students enrolling in the post-secondary peer mentoring programs. Other potential causes of the lack of diversity of students in programs for autistic students described in this review may also be related to publication bias, misdiagnosis, missed or late diagnosis, lack of access to support, stigma associated with disability in communities of color, and income disparities. As student support programs are continuing to strive for excellence in their work, it is important for them to utilize strategies to improve ethnic, racial, and gender diversity and inclusion. The lack of diversity in peer mentoring programs is a complex, multi-layered issue with roots long before autistic students are even considering college. Upstream factors may include diagnostic disparities and inequity in educational experiences and service provision; more proximal causes could relate to outreach and differences in students’ knowledge of how systems operate and how to access support. Research elucidating the causes of the limited inclusion of non-white, non-male students as study participants will hopefully inform efforts to ameliorate the disparity and expand access to this type of support program.

## Limitations of the Present Review

This review is intended to cover the topic of peer mentoring for autistic students in higher education in the peer-reviewed literature. This approach is limiting as many peer mentoring programs do not publish in peer-reviewed articles. Because of this, secondary descriptions of programs often use a different search strategy. For example, a recent paper describing autism-specific support programs at US colleges found 55 such programs meeting their criteria (Viezel et al., 2020). However, Viezel and colleagues used a search engine to locate program websites rather than sourcing programs from peer-reviewed journals. Of the 55 programs included in the

compilation by Viezel et al. (2020), only two were identified and included in this review (Pionke et al., 2019; Rando et al., 2016). Similarly, the College Autism Network (CAN) has listed 82 support programs serving autistic students (McDermott et al., 2020). Among them, only three programs conducted research that was published in a peer-reviewed journal. The programs identified by both Viezel et al. (2020) and CAN provide a variety of supports to autistic students, some of which include peer mentoring, though neither list includes information on student outcomes. Furthermore, we have only included articles in the English language, thus omitting potential articles in other languages.

## Future Directions

Further investigation is needed to understand why relatively few support programs for autistic students describe their programs and report the efficacy of their interventions in the literature. We speculate that this observation may be related to the disconnection of the mission of college student support programs (e.g., provide the most helpful services to the most students in need) and the demonstration of the results in scholarly research. Most staff members of student support programs are not researchers, and their job responsibilities do not include the conduct of scholarly research. Other potential factors may include low priority and little incentive to conduct research in most offices supporting autistic students; the lack of funding for research even when staff members are interested in researching the efficacy of their interventions for autistic students. The lack of funding for research speaks to the lack of focus by funding agencies on support for students with disabilities in higher education. To overcome these potential problems, higher education institutions may benefit from initiating collaborations between researchers and practitioners in student support programs.

To mitigate the lack of access to data representing the status of peer mentoring programs, the field will benefit from systematic investigations of program characteristics and effectiveness by interviewing coordinators, managers, and directors of peer mentoring programs and autistic students' support programs. Furthermore, critical analyses of annual reports, activity reports, working papers, presentations, evaluations, or white papers can also augment the investigation.

To improve the quality of research, investigators should strive to use common robust, validated measures. For areas such as academic and post-graduation outcomes, researchers have not established gold-standard measures. However, for many other areas, we do have robust measures to use. For example, the autism spectrum quotient (AQ) (Baron-Cohen et al., 2001) and Ritvo Autism Asperger's Diagnostic Scale-Revised (RAADS-R; (Ritvo et al., 2011)) are well-validated measures for assessing autistic traits in autistic adults. Well-validated assessments for self-determination include the

Self-Determination Inventory, a self-report measure based on the Causal Agency Theory (Shogren et al., 2014); the American Institutes for Research Self-Determination Scale (AIR-SDS), which measures factors causing self-determined behaviors (Wolman et al., 1994); and the Arc of the United States Self-Determination Scale (Arc-SDS), which assesses essential characteristics of self-determined behaviors (Wehmeyer, 1995). Various validated instruments for psychiatric symptoms are widely available. The Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2010) is a self-report measure of depression, which is commonly used in primary care settings and is sensitive to changes in the general population. Generalized Anxiety Disorder Assessment (GAD-7) (Spitzer et al., 2006) is a commonly used self-report measure of anxiety symptoms. These validated measures should be considered as outcome measures in future studies.

Another approach to understanding specialized support programs is to relax the eligibility criteria to include neurodiverse students more broadly. While the focus on a single condition is a common strategy to limit variability and increase power, a wider view of neurodiversity may be a helpful alternative approach for this type of applied research that allows us to better answer the question of "what works?" in peer mentoring programs. It is unlikely that colleges will have multiple, parallel peer mentoring programs for students with different neurodiverse conditions. More likely, schools will have a single support program; given the high degree of co-occurrence of neurodiverse conditions, there will be autistic students participating in ASD-specific programs who also have learning differences, ADHD and ID, and vice versa. One reason the conclusions drawn from programs not designed exclusively for autism are still relevant is that there is a significant amount of co-occurrence of neurodiverse conditions within individuals. Among autistic children, 15–31% also have a diagnosis of ADHD (Avni et al., 2018; Leyfer et al., 2006), and up to 63% have clinically relevant ADHD symptomatology (Avni et al., 2018; Hanson et al., 2013). In addition, nearly half of youth with ADHD (46%) also have a diagnosed learning disability, compared to 5% of youth without ADHD (DuPaul et al., 2013; Larson et al., 2011). Furthermore, the challenges students experience and the support they benefit from a cut across diagnostic categories. For example, executive functioning challenges and co-occurring mental health conditions are common in autistic individuals as well as those with ADHD and learning disabilities (Autism Spectrum Australia, 2013; Jackson et al., 2018; Kessler et al., 2006).

Another potential future direction is to study student support programs for students with ID. ASD is one of the most common co-occurring conditions in people with ID. The estimated co-occurrence of autism in individuals with ID was about 40% (Arvio & Sillanpaa, 2003; Matson & Shoemaker, 2009). Furthermore, co-morbidity of autism with

ID was found to associate with a greater vulnerability to anxiety, schizophrenia, eating disorders, and impulse control disorder (Cervantes & Matson, 2015). Several universities in the USA have admitted students with ID in their non-degree programs (Grigal & Papay, 2018). It is important to determine the effectiveness of mentoring programs in support of these students.

In conclusion, this review has demonstrated the potential of peer mentoring programs in improving academic and non-academic outcomes of students in higher education. We have identified tremendous opportunities in understanding what components of mentoring programs work and what potential outcomes we may want to target. Future studies in which student outcomes data are collected from a large group of peer mentoring programs would be beneficial. Even programs that are not conducting their own studies are likely to be collecting information on student outcomes for programmatic purposes (e.g., GPA, graduation and retention, employment status, resource utilization); these programs could contribute data to better understand whether autistic students, overall, are benefiting from peer mentoring programs. The use of standardized instruments to measure outcomes such as self-determination would further augment the utility of data and conclusions from individual studies. More published research not only benefits peer mentoring programs in the early phases of development but also serves the interest of existing programs which strive to enhance the success of their autistic students.

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