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**The Experience of Learning to Drive for People with Autism Spectrum Disorder**

Priscilla Vindin<sup>1</sup>, Nathan J. Wilson<sup>2</sup>, Hoe Lee<sup>1,3</sup>, and Reinie Cordier<sup>1,4</sup>

<sup>1</sup>School of Allied Health, Curtin University

<sup>2</sup>School of Nursing and Midwifery, Western Sydney University


<sup>3</sup>Department of Rehabilitation Sciences, Hong Kong Polytechnic University


<sup>4</sup>Department of Social work, Education and Community Wellbeing, Northumbria University

**Author Note**

Priscilla Vindin  <https://orcid.org/0000-0002-6253-1080>

Nathan J. Wilson  <https://orcid.org/0000-0002-6979-2099>

Hoe Lee  <https://orcid.org/0000-0002-3334-4294>

Reinie Cordier  <https://orcid.org/0000-0002-9906-5300>

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Correspondence concerning this article should be addressed to Priscilla Vindin, School of Allied Health, Faculty of Health Sciences, Curtin University, GPO Box U1987, Perth, WA, 6845 Australia. [priscilla.vindin@postgrad.curtin.edu.au](mailto:priscilla.vindin@postgrad.curtin.edu.au)

**Abstract**

Gaining a driver's license can be difficult for student drivers with autism spectrum disorder (ASD), yet little is known about their experiences of learning to drive. In this qualitative study, focus groups and individual interviews were employed to ascertain the perceptions of three participant groups including, people with ASD, parents of people with ASD, and driving instructors with experience teaching people with ASD to drive. Participants in each group were asked to discuss their feelings, concerns, and barriers, encountered while learning to drive, along with the driving behaviors, challenges, and strategies used when supporting people with ASD to learn to drive. Grounded theory analysis was used to shed light on the experience of learning to drive for people with ASD. Five themes emerged supporting the core construct that targeted support ameliorates intrinsic driving complexities, generating success: 1) challenges that increase the complexity of learning to drive, 2) external challenges to overcome, 3) concern about the reality of driving, 4) the need for a specialized model of training, and 5) success is possible. These findings highlight the importance of developing an autism-specific driving training intervention designed for people with ASD, their families, and driving instructors.

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### **The Experience of Learning to Drive for People with Autism Spectrum Disorder**

#### **Introduction**

Having a diagnosis of autism spectrum disorder (ASD) should not exclude people from the opportunity to learn to drive a vehicle. People with ASD are unique individuals experiencing varying levels of disability and limitations to daily functioning. Those without an intellectual disability, who independently manage many aspects of daily living, may still experience challenges in daily functioning such as deficits in cognition, motor coordination, and social communication, which may impact their ability to drive (Cox, et al., 2012; Huang & Winston, 2011; Lindsay, 2016). Research conducted in the United States showed that the proportion of adults with ASD who attain a driving license is 24%, considerably less than the general population at 75% (Feeley, 2010; Lindsay, 2016); however, the exact number of Australian learner or licensed drivers with ASD is unknown, in part due to under-reporting diagnosis at various licensing stages (Tyler, 2013). In the past decade, ASD rates have been steadily increasing, especially in young people aged 25 years or less who represent 83% of all people with ASD (Australian Bureau of Statistics, 2013). Furthermore, recent research suggests that the current prevalence estimates for young Australians with ASD are significantly understated (May et al., 2017). Therefore, there is a growing population of young people with ASD that will soon be faced with the decision of whether or not to commence learning to drive.

The ability to drive serves as an aid to independence which may improve life-long opportunities for individuals with ASD (Austroads and the National Transport Commission, 2016) as well as decreasing the level of community mobility dependence on family members. Driving independently aids in accessing services, employment opportunities, and socializing which, in turn, can improve quality of life (Almberg et al., 2015; Chee et al., 2014; Cox et al., 2012; Lindsay, 2016; Reimer et al., 2013). However, learning to drive can be difficult for

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people with ASD who often require more frequent driving lessons and take more attempts to pass their tests (Almberg et al., 2015; Lindsay, 2016; Tyler, 2013). Learning to drive is a complex task that may be exacerbated by characteristics associated with ASD, such as cognition challenges (e.g., inflexible thinking), deficient executive function (e.g., problems with planning, memory, and attention), impaired social communication (e.g., decreased theory of mind), emotional dysregulation (e.g., emotionally labile), and deficient motor coordination (e.g., poor motor planning) (Classen et al., 2013; Cox et al., 2012; Huang & Winston, 2011; Lindsay, 2016).

Currently, little is known about the impact that autism has on student drivers with ASD, as they progress through driving education (Almberg et al., 2015). Families and driving instructors have no autism-specific guidelines to assist them in making driving decisions, such as what age to start lessons or how to manage communication challenges (Huang et al., 2012). Previous research has focused primarily on the impact that ASD has on the skill development or performance levels of driving. Missing from education approaches for people with ASD has been a focus on the motivational and attitudinal factors as recommended by the Goals for Driver Education (GDE) framework. This framework comprises four hierarchical levels: 1) vehicle maneuvering (operational level), 2) mastering traffic situations (tactical level), 3) goals and context of driving (strategic level), and 4) goals for life and skills for living (behavioral level) (Hatakka et al., 2002; Peräaho et al., 2003).

To date, the perspectives of people with ASD and their families in regards to driving and driving education have been conducted via online surveys or Q-methodology (Chee et al., 2014; Cox et al., 2012; Huang et al., 2012). Through the use of in-depth interviews, this study seeks to add, for the first time, the perceptions of people with ASD who have direct experience with learning to drive, as well as exploring the views of the key informants involved in driving education; therefore, filling a gap in current knowledge. This study aims

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to shine a light on the underlying motivational, behavioral, and performance factors influencing the challenges faced by student drivers when learning to drive. Findings from this study may aid in the development of driving training interventions designed to provide guidelines for people with ASD, their families, and driving instructors.

### **Method**

#### **Research design and overview of study**

An exploratory qualitative design using a combination of participant-specific focus groups and individual interviews was used for this study. Focus group interviews were conducted for two participant groups, parents of people with ASD and driving instructors, as this allowed for discussion of shared experiences and individual perspectives (Krueger & Casey, 2014). For the third participant group (people with ASD) individual interviews only were employed as a more sensitive and socially comfortable approach that avoided the highly social context of a focus group (Nind, 2008). The semi-structured interview schedules were developed using findings from a scoping review (Wilson et al., 2018) and drawing on authors' expertise in the field. Open-ended questions prompted discussion on the following broad topics: a) feelings, concerns, and barriers encountered while learning to drive; and b) driving behaviors, challenges, and strategies used to support individuals with ASD to drive.

#### **Participants**

Participants ( $n = 32$ ) were recruited using convenience and snowball sampling methods to form three separate groups: student drivers or provisional driver with ASD ( $n = 8$ ), parents of individuals (preparing for driving and students or provisional drivers) with ASD ( $n = 14$ ), and professional driving instructors with experience training student drivers with ASD ( $n = 10$ ). The exclusion criteria included participants on the autism spectrum with epilepsy or intellectual disability and professional driving instructors without autism-specific experience. Participants were recruited using a contacts database held by an autism-specific research

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network, a Stakeholders Day for people with autism, and the research team's professional networks. Ethics approval was granted by the Human Research Ethics Office at Curtin University (Approval number: HRE2016-0103). For participants with ASD aged 16-18 years, both proxy and individual informed consent was gained. All participants gave consent to have their interviews digitally recorded. Table 1 provides a summary of the participant groups, including the type of interview.

<INSERT TABLE 1 ABOUT HERE>

### **Procedure**

Individual and focus group interviews that were conducted in person were held at a university campus office. For participants who were unable to attend in person (e.g., due to travel distance), phone interviews were conducted at a prearranged convenient time. All interviews were facilitated by two experienced researchers, the first author, and a research assistant. All interviews lasted between 60 and 90 minutes and were digitally recorded and transcribed verbatim by a professional transcription service.

### **Data Analysis**

The constant comparative approach of grounded theory was used to analyze all data. This approach is guided by a set of sequential inductive strategies, which provide a tool for developing concepts to shed light on previously unexplained social phenomena, such as learning to drive for people with ASD (Charmaz, 2006; Glaser & Holton, 2004). To aid the analytical process, the researcher was directly involved in the interviews and transcription interpretation process to achieve a deeper understanding of participants' experiences. Due to the use of a professional transcription service, the first author consistently listened to the audio recordings to confirm the interpretation of transcribed data to enhance the accuracy of the findings. The first author analyzed the data directly by reading the transcripts line-by-line with the following questions in mind: 'What is being said?' and 'What story is being told?'



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(Creswell & Creswell, 2018). Conceptual memos were written in the transcript margins to capture incidences that emerged into open codes ( $n = 262$ ). This was followed by linking related incidences, which were constantly compared and collapsed into axial codes ( $n = 48$ ). To enhance the trustworthiness of the analysis, both the first and second authors explored the potential fit of codes, thus enabling interpretation and conceptual integration into selective codes ( $n = 9$ ). Peer debriefing was also conducted during regular research meetings with theoretical coding occurring when consensus among the research team reached saturation forming five themes that led to the creation of the core construct (Charmaz, 2006; Glaser & Holton, 2004). Member checking was not performed as interviews were a one-off occurrence, rather than ongoing participatory research, and a high level of data saturation was achieved (Thomas, 2017). Pseudonyms have replaced names and any potentially identifying details have been altered. Abbreviations denoting the three participant groups are used; ASD1 to ASD8 to denote the people with ASD participant group 1, P1 to P9 to denote parent participant group 2, and DI1 to DI5 to denote driving instructor participant group 3.

### Findings

#### Core Construct

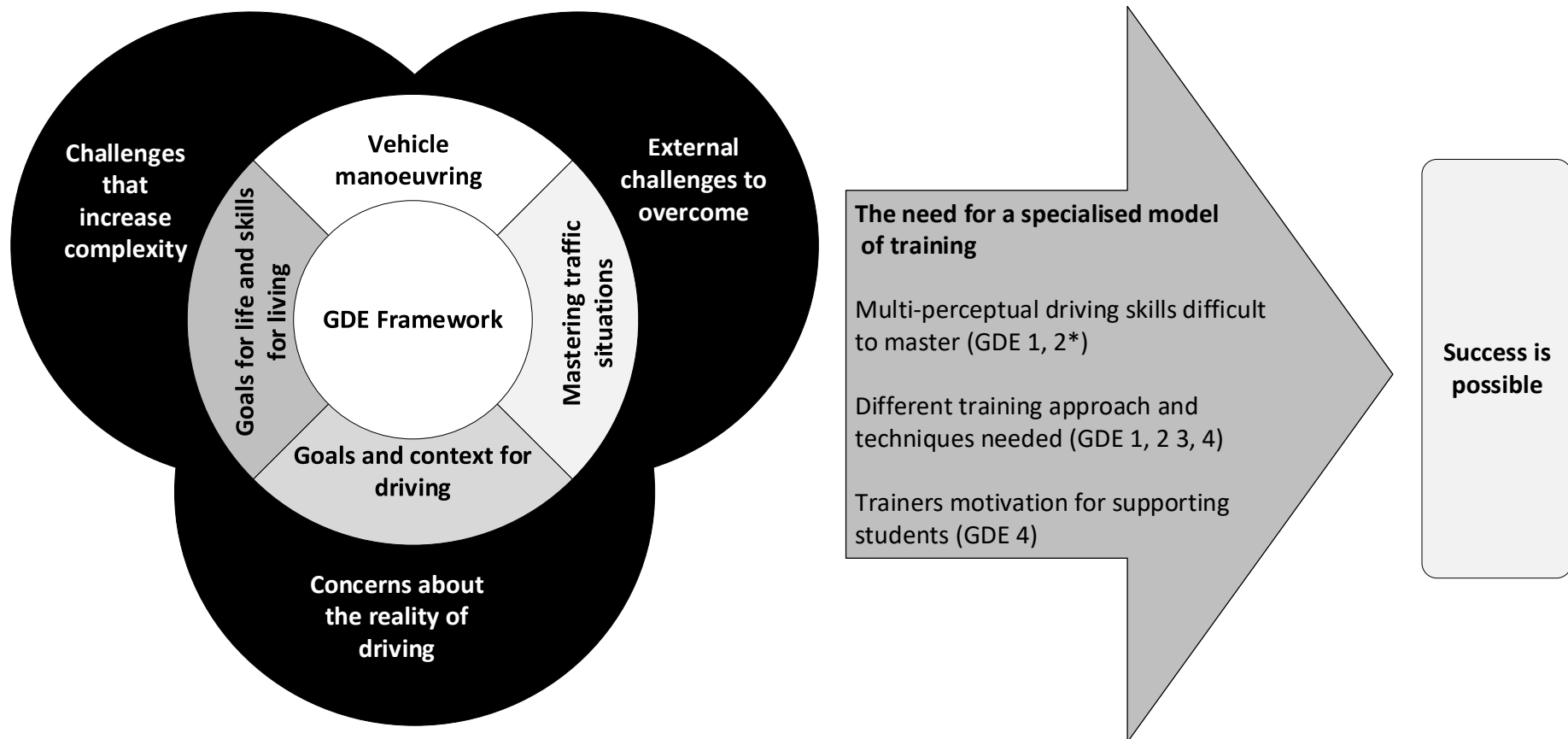
The core construct – *targeted support ameliorates intrinsic driving complexities, generating success* - was based on accounts by participants that for people with ASD, the experience of learning to drive and gaining a license was fraught with complexity due to the intrinsic nature of autism. External barriers added an additional layer of complexity. Driving success is achievable, with sufficient knowledge of the specific difficulties that occur when attempting to master driving skills, including the use of particular training approaches and techniques that can aid instructors in providing specialized requirements. The core construct was supported by five themes: 1) challenges that increase the complexity of learning to drive, 2) external challenges to overcome, 3) concerns about the reality of driving, 4) the need for a

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specialized model of training, and 5) success is possible. Figure 1 provides a conceptual model of the link between the themes, sub-themes, and the GDE framework, to illustrate that with knowledge of the specific challenges faced by student drivers with ASD when learning to drive, specialized driving education training that is cognisant of the GDE framework can be targeted to individual student's needs, aiding overall success.

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Figure 1. Conceptual model of the link between the core construct and GDE framework.



\*GDE framework levels: 1) operational, 2) tactical, 3) strategic, and 4) behavioural.

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### Challenges that increase the complexity of learning to drive

This theme consisted of five subthemes: 1) apparent anxiety that can hinder driving progress; 2) cognitive and executive function issues; 3) motor coordination challenges; 4) differences in motivation, confidence, and avoidance behaviors; and 5) social communication in driving contexts is difficult.

**Apparent anxiety that can hinder driving progress.** Although anxiety is common for all learner drivers, the level of anxiety experienced by students with ASD was described as often becoming extreme and, at times, creating a barrier to learning and gaining a license. When asked how they felt about learning to drive, participants with ASD described feelings such as nervous, scared, terrified, restless, overwhelmed, and “...*extremely anxious, mostly just that*” (ASD1). Concerns that increased the student’s anxiety included, having to learn and then use road rules, fear of not being able to grasp the multiple tasks required to drive, and the unexpected behaviors of other road users. Parents and driving instructors described how anxiety could sometimes develop into a panic attack, as stress levels increased to the point where students ‘froze’ or ‘shutdown’, for example,

*“Then I said ‘look, okay, what we’re going to do now is we’re going to start the car.’ Instantly the stress levels went up to almost panic attack ... started the car and literally he froze. That panic level, just everything just stopped. So, and I said ‘okay, you can turn the car off.’ He couldn’t even turn the key” (P1).*

There was a perception that people with ASD had a tendency toward perfectionism, which was linked to increased anxiety during driving lessons. One parent described how, “*This perfectionism which he’s suffered from all of his life, now it gets into his driving*” (P1). Parents shared how their child expressed a need to do things without error the first time. Participants with ASD also discussed how they wanted to do specific skills perfectly, “*I don’t know what [is] the perfect time to slow down in the traffic ...I don’t know which way, the*

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*perfect way to overtake*” (ASD3). Student drivers with ASD were described as becoming anxious, distressed or frustrated, losing their temper or even experiencing emotional or physical meltdowns when they made errors. Parents expressed concern that their child would give up learning to drive altogether if they found it too hard, *“If [participant’s child] can’t do it right the first time. He’ll just bail on it”* (P1).

As well as experiencing anxiety when learning to drive, students were also described as experiencing extreme anxiety when facing the practical driving assessment (PDA), which impacted their ability to maintain the driving skills they had achieved before sitting the test. This was illustrated by one participant’s experience,

*“Then as soon as I started the actual practical test, just the anxiety of that made me just forget everything. So even though I wasn’t you know, really terrible; because I was so anxious, I was just not able to do it properly”* (ASD1).

Students were used to driving with their parent/s or instructor, only to struggle with anxiety when being assessed by a person they did not know, *“They need to be comfortable in completing a driving assessment with someone that they’ve never met before”* (DI3). Parents and instructors commented on how destructive it was when students with ASD failed the practical test, *“The test is a massive obstacle ...we have had people [with ASD] who have such a bad experience with the [PDA] test that they just walk away and they don’t complete it and never come back to driving”* (DI3). Often it took students multiple attempts before they passed, *“It took him probably about six [PDA] tests to get to the one that passed”* (DI2).

**Cognitive and executive function issues.** All participant groups deliberated concerns about underdeveloped executive functions such as attention, sensory processing overload, cognitive inflexibility, concrete thinking style, reasoning ability, and spatial awareness. Attention was the main area of concern with problems related to being distracted and losing concentration as being particularly worrying for student drivers with ASD. Parents spoke

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about their child's inability to focus during driving lessons, "*He wanders off and gets distracted easily*" (P7). One parent example illustrated their child's process "*Once he winds himself up, he loses that concentration and then the mistakes come in ... it's the snowball effect*" (P1). Parents also described their child's propensity to focus their attention on one event or situation while ignoring anything else. Fixating attention became problematic when trying to teach their child multiple driving skills, "*He gets so intense and so focused on what he's doing that my concern is that he starts to be trapped in tunnel vision ...the blinkers come on*" (P1). Both parents and instructors stressed how dangerous attention issues were and the extra time dedicated to getting students to refocus. Attentional issues impacted lesson time, multitasking ability, speed maintenance, and students' understanding of instructions.

The increased cognitive demand placed on students when learning new driving skills also increased fatigue, "*In the beginning I find that they get very tired ...until they feel safer and more in control on the road, they get extremely tired*" (DI2). Parents also expressed concern that their child could become over-stimulated while driving, leading to the young person experiencing sensory processing overload, "*I think his main concern was probably a lot going on around him*" (P3). Instructors agreed that sensory overload was an issue for some of the students they taught, "*They can't deal with all the stimulus that comes in at once*" (DI2). Some children with ASD are taught early on to manage sensory overload by minimizing sensory stimulants in their environment. This technique may adversely impact their ability to process multiple stimuli present when they begin driving lessons. One participant with ASD provided their unique perspective,

*"I often don't pay enough attention to what's happening. Because it's very easy to sort of shut yourself into a little bubble where you are not paying much attention to what's happening around [you]. It's sort of a coping strategy that I grew up with. Because of you know sensory stuff"* (ASD1).

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Cognitive inflexibility was another concern raised by parents who stated that their child lacked the ability, *“To be fluid and being able to adapt to the driving conditions”* (P2). This concern was shared by driving instructors who pointed out that driving requires people to have a flexible thinking style, because *“Things have to be constantly changing and evolving on the road and they have to learn that they have to adapt to those things”* (DI3). The phrase ‘black and white’ was repeatedly used to describe students’ concrete thinking style and the proclivity to stick rigidly to rules, *“He doesn’t work in greys. He works in black and white”* (P1), and *“It’s that whole black and white thing again ...sticking to the rules”* (P8). Instructors described how they had experienced students who lacked the ability to reason and would question the application of certain road rules in different driving environments.

All participant groups raised concerns about spatial awareness issues. Many students with ASD struggled to understand where their vehicle was in relation to surrounding objects. One student articulated his experience,

*“So it’s hard for me to estimate how fast, how far away something is from me. So, whenever I would see something close to me on my side, ...I would feel it’s about to hit me because it looks close”* (ASD1).

**Motor coordination challenges.** Parents and instructors discussed how some students with ASD struggled with motor coordination actions which impacted their driving skill acquisition. For these students the time spent on developing driving skills took longer, one driving instructor recounted, *“I find that they have poor coordination skills. It just seems to take such a long time to get through those initial steps”* (DI3). Several parents described the difficulty their child experienced with planning and executing movements. One parent witnessed their child becoming overwhelmed with *“What was going on around him and actually doing it [operating the vehicle] with his hands or feet ...he struggled to get what he was thinking happening with the rest of his body”* (P3). Steering was a specific skill

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mentioned by the instructors as being impacted by motor coordination difficulties *“People with autism find it quite hard to cross their midline with their hands. So, if they’re trying to do something with their hand [while] steering, their steering just falls apart”* (DI5).

**Differences in motivation, confidence and avoidance behaviors.** There was a perception that people with ASD did not share the same intrinsic or extrinsic motivators to learn to drive as typically developing siblings or peers, *“With most teenagers the first thing they want is to drive ...but to him [child with ASD] it’s not so important”* (P5). Participants suggested that generally young people with ASD faced challenges creating opportunities to socialize; preferring to stay at home, which may impact their motivation to drive independently. Even when students with ASD got caught up in the hype to learn to drive while surrounded by their peers at school, their interest did not last once the school term ended, as one parent reflected, *“Then all of a sudden the enthusiasm just seemed to drop right off ... being away from that [peer group] sort of allowed that [interest in driving] to sort of dissipate”* (P2). Providing motivation to drive was left to parents, as illustrated in the following response, *“Well he’s mainly just doing it [learning to drive] because I’ve asked him to, it’s not something he’s hugely motivated to do”* (P4).

Also, the confidence levels demonstrated by students with ASD were described as either lacking or conversely being overconfident. Driving instructors described their concerns when students presented with low confidence and an expectation that they would underperform. This was illustrated in the following response, *“They come convinced that they couldn’t do it [drive] anyway ...a very negative insecure type of attitude”* (DI4), which created an obstacle for driving instructors to negotiate with students. Parents reflected on how they had to modify the initial lessons to accommodate their child’s lack of confidence, for example, *“Go in short lessons and once he’s confident, then we can start increasing what we’re doing”* (P9). However, there was a shared perception that some students demonstrated



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overconfidence in their ability to drive. One instructor described how, “*Some people [students with ASD] you are trying to bring back actually, they’re overconfident*” (DI3). In addition, being overconfident may lead some students to take risks. This was supported by one participant’s reflection on deciding to accelerate through changing traffic lights, “*When I’m driving there are times ...when I can be overconfident, and I’ll tend to do things that in retrospect I probably shouldn’t have done*” (ASD7).

Finally, all of the participants with ASD articulated a high level of awareness of their driving limitations, such as difficulty changing lanes, parking, not paying attention, busy traffic, slow reaction time, limited patience, and fatigue. Students described compensating for deficient driving skills by modifying their behavior or avoiding certain situations all together, for example, “*I try to do my best to avoid situations where that’s [changing lanes] necessary in the first place ... the same with parallel parking. I just can’t do it*” (ASD1). Parents and driving instructors witnessed the use of different avoidance behaviors used by students, such as sticking to roads with minimal traffic. Even after gaining their full license they continued to modify their driving behavior, “*They don’t drive in peak hour, they don’t drive for long distances, they tend to monitor where they go*” (DI2).

**Social communication in driving contexts is difficult.** When participants with ASD were asked if they experienced any social communication challenges, several responses given were indicative of limited theory of mind, for example, “*That doesn’t even really occur to me to look at them [other drivers]*” (ASD1).

Parents and instructors provided examples of when students with ASD experienced emotional meltdowns during social interactions, for example, some students preferred to not make direct eye contact. Driving instructors found this challenging to manage,

*“This young man [student with ASD], he’s sitting in the car and he looked over and this person [other driver] was watching him and he freaked out. He absolutely*

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*freaked out. Because this person was looking at him ... the light had turned green and he refused to move” (DI3).*

Driving instructors had to continually remind students why social communication skills were important when driving. One driving instructor described how, “*You say to them try and make eye contact with that person ...but you’ve got to explain it and you’ve got to teach it and you’ve got to show them” (DI2).*

Parents reflected on how their child demonstrated a heightened level of anxiety when being followed by another vehicle, “*He’s so worried about what the other people behind him think about what he’s doing” (P1).* They were also concerned with how their child lacked patience, becoming frustrated with other road users, especially when other drivers broke the road rules. Furthermore, many parents shared their concerns that their child would not be able to manage irate or aggressive drivers, “*That’s one of my big concerns, is how am I going to toughen him up for that [dealing with aggressive drivers]” (P1).*

### **External challenges to overcome**

This theme consisted of two subthemes: 1) parents can have a negative impact, and 2) added time and cost required to learn presents greater challenges.

**Parents can have a negative impact.** The driving instructor’s perceptions were that some parents found it difficult to accept that their child was on the autism spectrum and may require specific assistance when learning to drive. They suggested that driving success was hindered when some parents pushed their child to commence lessons at a young age, when they are not ready to drive, or even when their child showed no interest, “*I had one [student with ASD] that started when he was sixteen, his mum wanted him to learn to drive, he really wasn’t happy he was so anxious he didn’t want to get in the car” (DI2).*

Some parents were described by instructors as relying entirely on the instructors to teach their child with ASD to drive. This limited the students’ opportunities to practice skills

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that they were working on as opposed to when, *“You get a parent that backs up that training with you ...they’ve halved their time and doubled their [child’s] opportunity”* (DI3). When parents were involved, any substandard driving habits they exhibited became a challenge, *“They’re not getting the correct learning process ...one of the biggest detriments we have is their parents teaching them to drive”* (DI3). Also, teaching driving skills was not always amenable to the learning approaches that parents had adapted for their child with ASD, *“Some of the strategies that they [parents] use, we can’t use on the road”* (DI3).

Parents indicated that they did not feel that they were the right people to teach their child with ASD to drive, stating that, *“I just think we’re the wrong people, we will either get short with them, or we’ll say the wrong things”* (P2). Many parents were candid about their own anxiety, *“There’s no way I’m going to get in that car with Craig for the very first time or for the first 50 hours ...because otherwise I think my anxiety would feed onto him and then it would all go down the hill”* (P2). Furthermore, all participant groups agreed that it was common for male students with ASD to not want to learn or practice driving with their mothers. For example, one student stated, *“Mum wouldn’t be the best option”* (ASD2). This was supported by parents, *“So he’s calm when he’s with me [dad] and when he gets with mum, the stress levels go straight up”* (P1), and instructors, *“I find a lot of autistic teenagers usually don’t do very well learning, particularly learning from mum if they’re a boy”* (DI5).

**Added time and cost required to learn presents greater challenges.** Deciding who will teach students with ASD to drive is often unclear, especially when parents do not feel they have the ability to do so. For many families the cost of employing a professional driving instructor to provide lessons can be financially prohibitive, *“It’s [hiring an instructor] just financially not possible at the current time”* (ASD2), more so when students’ required extra lessons. Furthermore, funding options to receive driving lessons for people with ASD were not available, *“So quite often they can’t afford the however many lessons they need”* (DI3).

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Adding to the cost was the extra time that it took students with ASD to learn to drive. One parent described how it took them longer to adjust to their child's learning needs, *"Just trying to work out how he processes things differently"* (P3). Parents and instructors described how lessons progressed slowly due to the amount of extra time spent, *"Investing time in behaviors that your standard student doesn't have to take that much time to correct"* (DI3). Entire lessons could be devoted to mastering one specific skill because it *"Can take three to five lessons and they still can't do it"* (DI1).

### **Concerns about the reality of driving**

Two subthemes reflected participants' uncertainty about the reality of driving for students with ASD: 1) fitness to drive can be a deal-breaker and, 2) the reality of driving can be a major shock for students.

**Fitness to drive can be a deal-breaker.** Participant groups acknowledged that at times they questioned whether some people with ASD should get their license at all. This sentiment was shared by several instructors, *"Sometimes I do wonder how safe they are long term, I have to be honest about that, I do wonder"* (DI2). Moreover, parents expressed doubts that their child would be able to drive and they were fearful about them driving without supervision once they gained a full license.

Several instructors described how assessing fitness to drive was a difficult process. One instructor stated that, *"You have to give them a fair opportunity to demonstrate that they really cannot cope"* (DI2). There was a consensus among the instructors that when students with ASD did not make progress, it was best to be upfront with parents and to advise them to discontinue lessons, for example, *"We find there are some students that we just really are not sure are going to make it. And you don't want to be ...giving them [parents] a vain promise that one day they'll [child] drive"* (DI5).

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Driving instructors questioned when to decide to discontinue lessons as they were not provided with guidelines on ASD during their training. Often, they would refer students to an occupational therapist (OT) driving instructor for a driving assessment, *“It’s very rare that I will teach someone that’s on the spectrum without sending them for an assessment”* (DI2). OT driving instructors also became involved, *“When they’re not progressing with a driving instructor or they’ve had an incident”* (DI3). Some driving instructors suggested that for some students starting lessons when they were 16 years old was not the best option, *“I have suggested that his parents wait until he’s at least 23 or 24 before they put him [in] a car again”* (DI3). Many driving instructors agreed that delaying driving training for some students with ASD may be beneficial.

**Driving reality can be a major shock.** The interviewees with ASD discussed the dissonance they experienced between what they expected driving to be and the reality of actually driving. They described how strange they found the change from passenger to driver, *“When I first drove ...it wasn’t what I thought it would be”* (ASD7). Some students reflected on how difficult driving really was and how, *“I just sort of barely got by”* (ASD1).

Parents described how their child did not demonstrate an understanding of the potential consequences of driving in reality. For example, one parent described how, *“Initially, he thought he’d be able to do it [drive] hands down... it really didn’t last because ...reality kicked in”* (P1). Parents gave examples of how their child thought that they would find driving easy because they had experience playing driving games on gaming consoles, *“He thought that because he’s done racing games, he’d be able to do it [drive] easy-peasy. It did shatter him a little bit to realize that there was a lot more to do all at once”* (P1).

### **The need for a specialized model of training**

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This theme consisted of the following three subthemes: 1) multi-perceptual driving skills are difficult to master, 2) different training approaches and techniques are needed during lessons, and 3) trainers are motivated by a passion for supporting students learning.

**Multi-perceptual driving skills are difficult to master.** Several skills such as lane management, speed regulation, parking, and navigating roundabouts, were highlighted as being perceptually demanding for students with ASD. Complex skills that require students to recognize and interpret multiple sensory stimuli and manage kinaesthetic awareness, were especially challenging, *“Doing your blind spot checks when you’ve got head checks ...for the majority of them, they get quite nervous taking their eyes off the road”* (DI2).

Lane management skills such as changing lanes, merging lanes, and maintaining lane position were also considered difficult. Driving instructors highlighted that lane management skills were intimidating for some students with ASD due to motor coordination and perceptual processing difficulties they may have. A driving instructor provided the following example, *“So if you’re in the left lane and you need to change to the right lane, in the beginning it’s very hard for them because it’s a student that finds it difficult to judge speed and distance”* (DI2). Merging lanes were also described as being challenging due to both perceptual processing requirements and potential difficulties that some students with ASD experience with making decisions. For example, *“Just knowing if I’m supposed to go in front of the next person or behind them ...it’s not quite clear who goes first”* (ASD1). Parents were concerned with the difficulty that their child experienced maintaining the correct lane position, for example, *“He still has the tendency to veer left”* (P3).

Regulating the speed of the vehicle was a driving task that many students with ASD struggled with. One instructor articulated the issue with kinaesthetic awareness in the following way, *“a lot of them struggle with ... the speed control, being able to adapt to having to control [of] their speed with feeling”* (DI2). Parking was another multi-perceptual

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skill requiring spatial awareness that students found difficult to learn, *“Parking for me is really difficult, even now. Yeah, because, it’s sort of estimating where you’re going to go and then visualizing that sort of thing in your head”* (ASD1). Students also spoke about their concerns about understanding the complex road rules at roundabouts, while instructors were specifically concerned that students did not slow down upon approach to roundabouts. Parents shared the same concern with one parent describing how at a roundabout they were, *“Reminding her to slow down ...to an absolute stop if she needs ... so that she’s got time to actually physically turn and look”* (P8).

**Different training approaches and techniques are needed during lessons.** The instructors emphasized that teaching students with ASD was a different process to when teaching other students, *“You’re using the same strategies, but you have to implement them in a different way”* (DI3). All participants discussed how important it was to be patient during lessons with students, *“As long as the instructor is very patient and does not get angry or raise their voice, no matter what’s happening”* (DI5). The driving instructors emphasized that keeping the learning environment positive was another approach to help students with ASD reduce their anxiety levels, *“My approach would be really positive reinforcement ... particularly with autism; they need a lot of positive experience”* (DI3).

Parents reflected on how important it was for them not to take over during the lesson, *“You’ve got to sort of sometimes ...step back and let him actually do it his, his funny little way and, because it works for him”* (P3). Another recommended approach was to not throw students with ASD in the deep end or to push them past their limits. Instructors agreed that it was important to gauge a student’s psychological and physical state, which often meant that lessons needed to have more flexibility in duration to account for a student’s learning capacity and to avoid cognitive overload. Often the lessons were shorter than the booked time, *“I book an hour, I very rarely drive for a full hour”* (DI2).

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Controlling the driving environment, especially in the initial lessons, was considered important for students with ASD, *“I will probably use a stretch of road where there’s no cars, to set it up for him to succeed”* (P2). Driving instructors described techniques such as walking around the car to physically demonstrate driving skills, or using video recordings of lessons to fine-tune any skills that students may find difficult and to help improve their spatial awareness, *“So they’ve got that visual representation of what the goal is that they’re trying to achieve”* (DI3). One instructor with more than 20 years’ experience training students with ASD would visually demonstrate difficult driving skills by using toy cars, drawing on a whiteboard, or providing laminated diagrams of difficult traffic scenarios.

When communicating with students with ASD, instructors found that they needed to limit the number of words they used, *“It’s very important not to use too many words ...so we’re very careful with the words we use”* (DI5). Several parents reflected on how their child’s driving skill development progressed by breaking down tasks into small steps. They would not move onto a new task until they were sure that their child was ready, for example, *“Just give it [instruction] to him in little bits and then slowly incremental, just getting slightly more and slightly longer”* (P1).

Using consistent repetition to reinforce skills aided the learning process for students with ASD and was viewed as a training technique that played to their strengths, *“I would say the thing that is most consistent amongst all of them is repetition”* (DI2). The importance of providing lots of practice opportunities for students was also highly encouraged. Repeatedly practicing skills in varying driving environments and road conditions was a training technique viewed as especially important for the long-term safety of student drivers with ASD. Generalizing skills in multiple contexts aided in addressing issues with problem-solving abilities and cognitive rigidity, *“I think it’s more about practice. It’s about spending time doing the process and driving the car in different conditions”* (P6).



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**Trainers are motivated by a passion for supporting students learning.** Diving instructors expressed their awareness of the important responsibility that they had to make sure that students with ASD achieved the driving skill level required to pass the PDA and also to prepare them for future driving safety. One instructor summarised this awareness in the following way, *“I think the biggest responsibility with instructors [is] to help students ...you’re not only preparing them for that test you’re preparing them with a life skill to be able to drive safely which is a huge responsibility”* (DI2).

Driving instructors acknowledged that it was sometimes difficult to build rapport with students with ASD, *“To actually build up a relationship with them, which is very difficult for them, initially because they’re not used to interacting with people, they struggle so much with the communication”* (DI2). However, they noted that building a relationship with students aided in their overall success. They pointed out that it was up to the instructor to help the student feel secure, *“You try and find out what they’re interested in, are they interested in sport, are they interested in travel”* (DI4). Several instructors expressed a genuine interest in understanding the lived experience of students with ASD that they taught, one instructor describing, *“I’ve had quite a lot of them open up to me and explain ...what it’s like for them watching the world go by not being able to comfortably participate in it”* (DI2). Instructors also described highly developed observational skills whereby they were able to pick up on changes in some student’s body language (e.g., avoiding eye contact when anxious), which helped them to modify their teaching style. This showed how experienced driving instructors became attuned to the specific nuances associated with autism, *“I think the most important thing is that you have, a word that most people don’t use this day is - empathy”* (DI4).

### **Success is possible**

Instructors pointed out that although there were some commonalities, such as communication issues, each student’s behaviors were expressed differently, therefore driving

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training was, “...*really individual and it’s just a case of finding your way in with that person*” (DI3). Individuals with ASD were described as having multiple strengths, for example, high levels of intelligence. Parents and instructors pointed out that many students were very good at learning the road rules, “*He has impeccable knowledge of the road rules*” (P1). Parents were often surprised by their child’s ability to learn to drive, “*He’s surprised us already with how much he can handle*” (P1), and “*He is a lot better than we imagined*” (P7). Parents also expressed why it was important for their child to gain a license and to experience independence, for example, “*They need it for socializing and they need it for work or they need it for study. But just to be like everybody else and being included ...it would create a sense of self-importance*” (P2).

Participants acknowledged that when initially learning how to drive, many students with ASD struggled to master certain driving skills. However, having an understanding of the challenges that students with ASD face and adapting training to the needs of each individual meant that difficult skills were eventually mastered, “*They’ve been absolutely fine years down the line ...they’ve managed really well*” (DI2). Therefore, many students will be successful in gaining their driver's license and maintaining safe long-term on-road driving.

## Discussion

The findings from this study represent the perspectives of people with ASD in relation to their experience of learning to drive, triangulated with the views of their parents and experienced driving instructors. While findings from the study recognize that student drivers with ASD face challenges when learning to drive and gaining a license; however, targeted support can ameliorate intrinsic driving complexities, leading to success. The challenges appear to be, both universal among student drivers with ASD in varying degrees, and also exacerbated by characteristics associated with autism. The findings support previous research showing that difficulties with executive function, motor coordination, social communication,

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and emotional regulation add challenges to learning to drive and driving for people with ASD (Cox et al., 2015; Lindsay, 2016). However, findings also showed that successfully learning complex driving skills can be enhanced via the use of targeted training approaches and techniques, which are informed by knowledge of the specific challenges faced by student drivers with ASD. This is a critical new insight for consideration when developing driving education and training interventions aimed at the needs of people with ASD.

The current findings supported the notion that student drivers with ASD experienced difficulty learning operational and tactical level driving skills ( Peräaho et al., 2003). Moreover, the executive function deficits that had the most negative impact on student's ability to develop driving skills were attention and cognitive inflexibility. For example, attention is central to mastering vehicle maneuvering at an operational level of driving training. Students with ASD are known to experience difficulties with divided attention and struggle with shifting their attention between driving tasks (Almberg et al., 2015; Huang & Winston, 2011; Peräaho et al., 2003). Students recounted how they were unable to manage their attention during lessons, which heavily impacted their ability to learn, which, in turn, also stretched parents' and instructors' ability to train driving skills.

A novel finding was that, at a behavioral level, students with ASD did not show the same level of motivation to learn to drive as neuro-typical students. Previously, the personal motives or driving goals for people with ASD have not been described in the literature. However, this study found that the motivation to drive may be different in people with ASD, which may be due to differences in socializing behaviours or preferences in using other modes of transport. When students are not intrinsically motivated to learn to drive, teaching complex driving skills may be more difficult for trainers. For example, if a student is only learning to drive due to prompting from their parents, then they may be less inclined to pay attention to driving instruction for a skill they find difficult to master. Understanding the

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driving goals of students with ASD and what is motivating them to learn to drive is of considerable importance for driving education (Peräaho et al., 2003).

People with ASD are often faced with disablist views of low expectations in their ability to do certain activities due to the presence of limitations. The message that activities such as learning to drive may be too difficult for them or even impossible, can impact their confidence and anxiety levels (Sylvester et al., 2014). Participants with ASD in this study recognized the limitations that would directly impact their ability to learn to drive. Furthermore, many demonstrated an acute awareness of their personal needs when it comes to learning how to drive even describing avoidance behaviors that they use to improve their driving experience. This information needs to be recognized and used to inform parents and instructors on how to target training approaches and techniques. Also, as young people with ASD transition from high school to work, collaborative forecasting about learning to drive needs to become a part of transition planning, with due consideration of the right age to start, the time it will take, and associated costs (Huang et al., 2012).

Important questions were raised about the reality of driving for people with ASD, with many participants unsure of both the ability of some students to learn to drive and their long-term safety. Autism is a spectrum disorder with participants acknowledging that for some students who experience more daily functioning limitations, learning to drive might simply not be possible. It remains unclear who makes the decision on a student's fitness to drive, however, what was clear from the findings is that there is currently no support or guidelines available for families and driving instructors on how to assess a student's readiness or potential to learn to drive. Young students who fail to learn to drive may not be ready, however, could potentially pass if advised to try again in a few years.

These exploratory findings suggest that successful driver education could focus on the following five areas: 1) assessing fitness to drive, 2) training strategies, 3) building rapport,

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4) communication style, 5) and anxiety management. In terms of fitness to drive, for some students it may be better to wait until they are older before they start driving lessons. For those who are struggling after a few lessons, have them assessed by an OT trained assessor to tailor a plan according to the individual's needs. Consider the following training strategies for suitability: use visual demonstrations, keep lessons short with breaks, focus on hazard perception skills, break tasks down into small incremental components, teach skills step-by-step and do not move on until the task is mastered, and avoid having long gaps between lessons as it can set students back. Focus on building rapport with students by helping them to feel secure and working to their capacity and comfort level. Driver instructors may have to adjust their communication style by using fewer words and implementing regimented instructions by explaining skills the same way each time. Learner drivers' anxiety can be managed by providing lots of advance warning and structure, keeping the appointments consistent, notifying them in advance what they will be doing during the next lesson, and by introducing the student to the person that will be conducting their practical assessment prior to the assessment itself.

### **Limitations**

The main limitation in this study was the small sample size which included some members of the same families, either siblings or parent and child, being interviewed. Also, the experiences of individuals with ASD who have a full license were not sought in this study. This may limit the range of driving experiences discussed and needs to be considered in future research. A limitation in this study is that ASD diagnosis was self-reported by parents and individuals with ASD. Hence it cannot be ruled out that participants did not have an official ASD diagnosis at the time of the interview. Furthermore, the student drivers interviewed in this study were all male. It is therefore unknown if female students with ASD also face challenges learning to drive with their mother. Future research should include a

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larger sample of female student drivers with ASD to provide insight into potential gender differences. Another limitation is that it was unknown how many years' experience the driving instructors had training people with ASD, which may limit their knowledge of specific challenges faced by people with ASD.

### **Conclusion**

For people with ASD learning to drive a vehicle is complex due to characteristics associated with autism and the external challenges that they and their families face. The underlying motivation to drive was found to be different for student drivers with ASD. There were also behavioral and performance factors such as problems with attention and difficulty mastering complex driving skills that impacted on student driver's ability to learn to drive. However, driving success is possible when aligned with knowledge of specialized driving training techniques. To be able to support people with ASD to learn to drive and gain their license, these findings highlight the need for an autism-specific approach to driving education that will provide guidelines for people with ASD, their families, and driving instructors.

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