

1 **Closing the gap between theory and practice: conceptualisation of a school-based**
2 **intervention to improve the school participation and feelings of connectedness of**
3 **primary school students on the autism spectrum.**

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28

29 Abstract

30 Limited interventions exist that support student's school participation. This paper describes a theoretical
31 model of school participation and the iterative process that led to the development of an intervention that aims to
32 improve the school participation of students on the autism spectrum and their typically developing peers.

33 Literature on autism, school participation and intervention research were integrated to develop a theoretical
34 model. Focus groups, a Delphi study, online surveys, and reference group consultation helped to develop and
35 refine the intervention. A novel school-based intervention was developed. The impetus to develop interventions
36 with a strong theoretical rationale is discussed.

37 *Key words:* psychosocial intervention; schools; autism; theoretical model; intervention development.

38

Introduction

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School participation is essential to students' social, emotional and academic development

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(Frederickson, Simmonds, Evans, & Soulsby, 2007). In recent years there has been growing concern about the

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school experiences of students on the autism spectrum. This research indicates that students on the autism

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spectrum experience significant school participation restrictions and are more likely to experience bullying, less

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social support and more frequent suspensions compared with typically developing peers (Humphrey & Symes,

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2010; Jones & Frederickson, 2010). Persistent challenges participating at school can lead to students feeling like

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they do not belong at school, which can have a significant long-term impact on student outcomes (Shochet,

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Dadds, Ham, & Montague, 2006). However, there are limited interventions available that specifically aim to

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increase student's participation at school (Centers for Disease Control and Prevention, 2009).

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The development of interventions that aim to improve students' school participation requires an

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understanding of the construct of school participation and factors that support or hinder students' experiences.

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This is critical, as without a clear understanding of the construct, we cannot be sure interventions are targeted

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appropriately. In this paper, we present a theoretical model that illustrates the interaction between characteristics

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of autism and factors that promote school participation. We then describe how we used this theoretical model to

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engage in a multi-stage iterative process to develop a school-based intervention aiming to improve the school

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participation of primary school students on the autism spectrum and their typically developing peers.

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The research team

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The development of the theoretical model and resulting intervention was led by authors of this paper.

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The primary author is a registered occupational therapist with clinical experience working with children and

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young people with a range of disabilities, specialising in providing community based consultative services to

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support school aged students on the autism spectrum, their families, and educators. (Author name removed for

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peer review) research focuses on promoting the social inclusion of children with various developmental

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disabilities, such as autism, measurement and psychometrics and developing evidence-based psychosocial

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interventions. (Author name removed for peer review) has extensive clinical and research experience in area of

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autism, early intervention, and the impact autism has on participation. (Author name removed for peer review)

64

has research experience in school participation and the involvement of children with atypical learning needs.

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The expertise of the research team is important to describe as it provides context and validates the theoretical

66

model and intervention as an expert led, research informed initiative.

67 **The proposed theoretical model of school participation and autism**

68 The theoretical model of school participation and autism (MSPA) was constructed following a critical
69 appraisal of the literature relating to autism, school participation and intervention research. Authors reviewed all
70 studies included in a systematic literature review of the psychometric properties of school connectedness
71 measures (see review for search terms and studies included; Author, 2018). Additional searches were conducted
72 using a range of databases such as CINAHL, Embase, ERIC, Medline, PsycINFO, to identify studies exploring
73 the relationship between characteristics of autism and school participation, as well as intervention techniques
74 used and found to be effective in facilitating the school participation of students on the autism spectrum. All
75 studies were independently reviewed by the primary author, and then by the research team, based on a pre-set
76 criteria to determine the strength of the relationship between factors illustrated in the MSPA. Relationships in
77 the MSPA were considered ‘strong’ if more than 70% of studies reviewed showed a direct relationship between
78 factors in the MSPA (e.g., the social communication skills of students on the autism spectrum improved
79 following a peer mediated intervention), the purpose of the study was clearly linked to factors in the MSPA, the
80 quality of studies was quasi-experimental or higher and there were autism specific findings. Relationships were
81 considered ‘emerging’ if less than 70% of studies reviewed showed a direct relationship, the purpose of the
82 study was not clearly linked to factors in the MSPA, the quality of studies was lower than quasi-experimental or
83 only used qualitative methodology, and findings were not autism specific. Integrating literature on autism, with
84 literature on school participation and intervention research enabled us to construct an evidence-based theoretical
85 model that depicts the interactive process between characteristics of autism and factors that promote school
86 participation.

87 The MSPA is based on Imms and colleagues’ (2016) framework of participation, called the family of
88 Participation and Related Constructs (fPRC), which was developed following a systematic literature review of
89 language, definitions and constructs used in participation intervention research with children with disabilities
90 (Imms et al., 2015). The MSPA extends the fPRC by applying the fPRC to students on the autism spectrum in
91 the school environment. According to the fPRC, participation comprises two essential components: “*attendance*
92 – defined as ‘being there’ and measured as frequency of attending, and/or the range or diversity of activities;
93 and *involvement* – the experience of participation while attending” (Imms et al., 2016, p. 18). In the context of
94 education, this means being actively engaged in activities, tasks and routines that are typical for students of that
95 age in a given education system, as well as a subjective feeling of belonging, and being active in the school

96 environment (Libbey, 2004). Merely being present in a mainstream classroom does not lead to participation and
97 is not indicative of successful inclusion (Symes & Humphrey, 2012).

98 Based on the fPRC, several intrinsic factors can influence and, in turn, are influenced by participation
99 (Imms et al., 2016). Intrinsic student factors impacting school participation include students' – *activity*
100 *competence* (i.e., the ability to execute an activity to an expected standard; Imms et al., 2016), *sense of self* (i.e.,
101 personal perceptions related to students confidence, satisfaction, self-esteem and self-determination; Imms et al.,
102 2016) and *preferences* (i.e., interests or activities that hold meaning or are of value; Imms et al., 2016). These
103 factors are considered antecedents to, and consequences of, school participation – they influence future
104 participation and are influenced by past and present participation (Imms et al., 2016). For example, to participate
105 in an activity at school students must have a degree of interest; however, through participation students' interest
106 may increase or they may develop new interests that hold meaning or are of value to them.

107 In addition to extending the fPRC to schools, the MSPA includes students' sense of school connectedness
108 as an *additional intrinsic student factor*, based on a large body of literature emphasising the significant impact
109 reduced school connectedness has on students' school participation and student outcomes (Furlong et al., 2003;
110 Maddox & Prinz, 2003; Shochet et al., 2006). The MSPA also acknowledges that all participation occurs within
111 a contextualised setting and recognises the moderating and mediating impacts students' school, family, and
112 community environments have on students' school participation (Anaby et al., 2014; Colver et al., 2012;
113 Eriksson, 2005). Environmental factors, such as the impact unexpected changes in the curriculum, attendance at
114 school events such as sports carnivals, and the implementation of evidence based intervention techniques has on
115 students school participation, have been explicitly illustrated in the MSPA. Broader social and cultural
116 environmental factors, however, such as peer and teacher understanding, awareness and acceptance of autism
117 and teachers knowledge, attitudes and skills in supporting students with diverse learning needs, have not been
118 explicitly illustrated in the model due to layout restrictions, but are recognised as factors that can impact student
119 school participation.

120 Figure 1 outlines the MSPA. The centre of the model represents the school participation transaction and
121 shows that any reduction in intrinsic student factors (i.e., due to characteristics of autism or environmental
122 factors) needs to be offset by school participation enablers (i.e., intervention techniques). Uni- and bi-directional
123 arrows are used to illustrate relationships between factors and a colour coding system has been used to assist
124 with readability and interpretation. Solid lines between factors indicate that the relationship between factors is

125 strongly supported in the literature, whereas dotted lines indicate the relationship between factors is still
126 emerging in the literature.

127 *[Insert Figure 1 here]*

128 School participation barriers that result from characteristics of autism (illustrated from left to centre in
129 Figure 1), such as difficulty establishing and maintaining friendships, are specifically linked to intrinsic student
130 factors in the centre of the model. For example, literature suggests difficulty regulating emotions impacts
131 student's capacity to learn effectively (Laurent & Rubin, 2004) and impacts the development of social,
132 communication and problem-solving skills (i.e., activity competence; Prizant & Wetherby, 2005). This
133 relationship received a dotted line as relationships identified in the literature were indirect or inferred and not
134 always autism specific.

135 School participation enablers and intervention techniques used to implement these enablers (illustrated from
136 right to centre in Figure 1), are also linked to intrinsic student factors as depicted in the centre of the model. For
137 example, literature suggests peer mediation is a robust method for teaching and improving academic and social
138 communication skills, as well as improving peer acceptance and reducing social isolation (Bene, Banda, &
139 Brown, 2014; Wang, Cui, & Parrila, 2011). The relationship between peer mediated intervention and activity
140 competence received a solid line as there have been several autism-specific experimental studies conducted
141 outlining strong direct relationships as well as reviews and meta-analyses (Bambara, Cole, Kunsch, Tsai, &
142 Ayad, 2016; Banda, Hart, & Liu-Gitz, 2010; Bene et al., 2014; Rodriguez-Medina, Martin-Anton, Carbonero, &
143 Ovejero, 2016; Strain, Kerr, & Ragland, 1979; Wang et al., 2011). Conversely, the relationship between peer
144 mediated intervention and school connectedness received a dotted line as relationships in the literature were
145 largely inferred and the purpose of studies were not clearly linked to the concept of school connectedness
146 (Kasari, Rotheram-Fuller, Locke, & Gulsrud, 2012; Rodriguez-Medina et al., 2016). Inconsistency in the way
147 school connectedness is conceptualised and defined, however, may contribute to lack of strong evidence to
148 support this relationship. To effect change in student school participation, the MSPA proposes school
149 participation enablers as implemented through intervention techniques need to offset the barriers that result from
150 characteristics of autism. The proposed model is described briefly below in relation to four intrinsic student
151 factors of school participation and autism.

152 ***Activity competence and autism***

153 The school environment is complex and requires many skills to successfully navigate. Autism can impact
154 the development and performance of several skills, such as social communication, which can significantly

155 impact students' ability to participate at school (Saggers, Hwang, & Mercer, 2011; Saggers et al., 2016). Social
156 communication participation restrictions can include difficulty establishing and maintaining friendships at
157 school, engaging in social interactions, expressing needs and wants and asking for help at school (Author,
158 2020). Literature suggests students on the autism spectrum are less likely to initiate social interactions and spend
159 a larger proportion of time engaging in non-social play at school (Koegel, Vernon, Koegel, Koegel, & Paullin,
160 2012). Students' school participation can be further impacted by hyper or hypo reactivity to sensory input with
161 noise, touch, and the ability to stay still, identified as sensory preferences, significantly impacting students'
162 learning and performance at school (Saggers et al., 2016). Furthermore, impaired executive functioning skills,
163 such as problem solving and attention, can result in students having difficulty adapting their behaviour,
164 following instructions, and being part of a group (Torrado, Gomez, & Montoro, 2017; Zingerevich & LaVesser,
165 2009).

166 Several effective intervention techniques have been identified to improve the social communication, play
167 and problem-solving skills of students on the autism spectrum including peer mediation (e.g., large effect size
168 (ES) = 1.3, 95% CI; Wang et al., 2011); role play (e.g., medium ES = 0.92, 95% CI; McCoy, Holloway, Healy,
169 Rispoli, & Neely, 2016), video modelling (e.g., large ES = 1.22, 95% CI; Wang et al., 2011), and direct
170 instruction (Ganz & Flores, 2009; Klinger, Klinger, & Pohlig, 2007). Peer mediated interventions facilitate
171 active student engagement by providing students with frequent opportunities to respond, and provide prompts
172 and feedback (Bene et al., 2014; Wang et al., 2011). Results from a meta-analysis found peer mediated
173 instructional arrangements to have a significant impact on students on the autism spectrum in academic content
174 areas (e.g., reading, comprehension), as well as social communication skills and reducing problem behaviours
175 with an average ES of 0.82 of all studies reviewed (95% CI; Bene et al., 2014).

176 *Sense of self and autism*

177 While skills are necessary to be able to participate at school, another key factor impacting student school
178 participation is students' sense of self, including students' confidence (i.e., students' perceived competency,
179 skill and capability to deal effectively with various situations; Shrauger & Schohn, 1995), satisfaction (i.e., short
180 term attitude resulting from an evaluation of students educational experience, services and facilities;
181 Weerasinghe, Lalitha, & Fernando, 2017), self-esteem (i.e., overall subjective sense of personal worth or value;
182 Blascovich & Tomaka, 1991) and self-determination (i.e., ability to think and make decisions without external
183 influences; Hui & Tsang, 2012; Imms et al., 2016). Lack of structure and predictability in the school
184 environment, students' awareness of limited social relationships and difficulties connecting with peers, and

185 persistent challenges participating at school can result in students feeling less satisfied and confident at school
186 which can lead to a negative sense of self (Humphrey & Lewis, 2008). As a result of these challenges, students
187 on the autism spectrum are more likely to experience bullying and social isolation (Rowley et al., 2012), leading
188 to increased risk of anxiety and depressive symptomatology (Shochet et al., 2006).

189 Interventions utilising a strengths-based approach that aim to increase students' self-awareness of
190 differences and provide opportunities for students to make choices, in line with principals of social and
191 emotional learning (Jones & Bouffard, 2012; Pasi, 2001; Romasz, Kantor, & Elias, 2004), have been found to
192 contribute to an improved sense of self for students on the autism spectrum (Niemic & Ryan, 2009; Reutebuch,
193 Zein, & Roberts, 2015). Cognitive based strategies such as seeking evidence for and against the validity of
194 thoughts, identifying consequences for holding a particular belief, and categorising thought distortions have
195 strong evidence to support their effectiveness in improving self-esteem, reducing anxiety symptoms, self-report
196 school anxiety and social worry for students on the autism spectrum (Chalfant, Rapee, & Carroll, 2007; Lee,
197 Simpson, & Shogren; Luxford, Hadwin, & Kovshoff, 2016; Wood et al., 2009). For example, a study by Wood
198 et al., (2009) reported a significant reduction in anxiety symptoms for students on the autism spectrum
199 following a cognitive behavioural therapy intervention with a large reported ES of 2.46 (Cohen, 1988). Finally,
200 task and environmental modifications such as the use of multi-media to increase student enjoyment (Hiemann,
201 Nelson, Tjus, & Gillberg, 1995) and providing access to a range of activities that cater to students diverse
202 interests, in line with principals of universal design (Center for Applied Special Technology, 1998; Orkwis,
203 2003; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007), have also been found to increase students
204 sense of self (Eime, Young, Harvey, Charity, & Payne, 2013; Hinchliffe, Saggars, Chalmers, & Hobbs, 2016;
205 Mahoney, Cairns, & Farmer, 2003).

206 ***School connectedness and autism***

207 The extent to which students feel valued and cared for in their school community, referred to as school
208 connectedness, is considered a predictor as well as an outcome of student school participation (Ciani,
209 Middleton, Summers, & Sheldon, 2010). A study by Wainscot and colleagues (2008) reported 90% of students
210 on the autism spectrum felt they were disliked by someone at school. Studies also report students on the autism
211 spectrum have fewer friends and that their friendships are of poorer quality (Kasari, Locke, Gulsrud, &
212 Rotheram-Fuller, 2011).

213 Modification to the social and physical environment, such as improving peer and teacher awareness and
214 understanding of autism, has been linked to improved sense of connectedness at school (Batten, Corbett,

215 Rosenblatt, Withers, & Yuille, 2006). Peer mediated interventions focusing on increasing peer acceptance of
216 autism and basic strategies to promote inclusion have also been found to improve the school connectedness of
217 students on the autism spectrum (Harper, Symon, & Frea, 2008; Owen-DeSchryver, Carr, Cale, & Blakely-
218 Smith, 2008). For example, a study by Kasari and colleagues (2011) reported students on the autism spectrum
219 received more friend nominations from their peers and were observed to be less isolated in the playground
220 following the implementation of a peer mediated intervention.

221 *Preferences and autism*

222 The motivation to participate rests on the premise that there are interests or activities at school that hold
223 meaning or are of value to students (Imms et al., 2016). Students on the autism spectrum often have intense
224 interests and a preference for sameness, which can impact their ability to participate in activities or subjects that
225 are not an area of interest and manage when there is an unexpected change at school (Koegel, Singh, & Koegel,
226 2010). These challenges often result in students engaging in behaviours that can be disruptive in the school
227 environment, which further impacts students' capacity to participate at school (Saggers et al., 2016).
228 Furthermore, the school environment is often highly structured with limited flexibility in how the curriculum is
229 taught; limiting students' capacity to make choices and feel in control. Incorporating students' interests and
230 allowing choice and control in interventions has been found to improve students' motivation, task completion
231 and socialisation and reduce disruptive behaviour (Koegel, Kim, Koegel, & Schwartzman, 2013; Reutebuch et
232 al., 2015; Ulke-Kurkcuoglu & Kircaali-Iftar, 2010).

233 Current interventions for students on the autism spectrum tend to focus on targeting students' skills in
234 isolation, with an expectation there will be a flow-on effect on students' participation (social skills; Mackay,
235 Knott, & Dunlop, 2007; McConnell, 2002; Ostmeier & Scarpa, 2012). The MSPA highlights that to effect
236 change in students' school participation, a holistic approach using evidence-based intervention techniques is
237 required, targeting not only students' skills (i.e., activity competence), but also psychological aspects (i.e., sense
238 of self, school connectedness and preferences) of students' school experiences. We used the MSPA as a
239 theoretical foundation to guide the development of a school-based intervention aiming to improve school
240 participation of primary school students on the autism spectrum and their typically developing peers from
241 conceptualisation to implementation in the school environment.

242 **The multi-stage iterative process of developing the school-based intervention**

243 A series of research activities and studies informed the development of the school-based intervention,
244 which involved: (a) a literature review of effective components of existing school-based interventions; (b)

245 regular consultations with a consumer and stakeholder reference group (CSRG); (c) focus groups with parents
246 and educators to explore their perspectives on the school participation of students on the spectrum and gain
247 general recommendations regarding the intervention (Author, 2020); (d) a national 2-round Delphi study to gain
248 consensus on the application of the fPRC to students on the autism spectrum and recommendations on the
249 content, delivery and feasibility of the intervention (Author, 2019); and (e) feedback from students, parents,
250 educators on intervention resources.

251 Ethics approval was obtained from the Human Research Ethics Committee at Curtin University
252 (HREC2016-0150) and permission granted from relevant schooling sectors, such as Catholic Education Western
253 Australia and the Association of Independent Schools Western Australia (AISWA) prior to data collection.
254 Figure 2 illustrates the multi-stage iterative process of developing the intervention and outcomes of each stage
255 of the research, described below.

256 *[Insert Figure 2 here]*

257 **Literature review**

258 ***Effective components of existing school-based interventions***

259 Research indicates school-based interventions that yield the most successful results are those that are
260 embedded across the whole school, using a multi-modal approach (Clark, Adams, Roberts, & Westerveld, 2019;
261 Goldberg et al., 2019). This approach typically involves coordinated action between "...curriculum, teaching
262 and learning, the school ethos and environment and family partnerships" (Goldberg et al., 2019, p. 771). The
263 primary author conducted a series of electronic database searches to identify intervention studies or reviews that
264 reported on the effectiveness of school based interventions. Included studies were published in the last 15 years,
265 reported on the effectiveness of intervention components of *school* based interventions but were not necessarily
266 specific to students on the autism spectrum. Studies were independently reviewed and summarised by the
267 primary author, and then discussed with the research team, until agreement was reached to identify core
268 components of the intervention. These included: (a) professional learning for teachers and school leadership
269 staff; (b) teacher-led whole class lesson plans; (c) peer training for selected peers; (d) activity ideas to
270 incorporate key messages across the whole school; and (e) weekly parent information handouts and invitations
271 for parents to participate in the intervention.

272 The provision of professional learning is imperative to support the integration and sustainability of school-
273 based interventions (Clark et al., 2019). Teachers often report a lack of training in relation to students on the
274 autism spectrum. For example, in a recent study in Sweden, only 14% of staff reported receiving any formal

275 training in teaching students with neurodevelopmental disabilities (Bartonek, Borg, Berggren, & Bolte, 2018).
276 As a result, teachers often felt ill-equipped to meet student needs and deliver school-based supports. The
277 professional learning component of the intervention includes training and ongoing support, including
278 information related to autism, as well as specific instructions on how to implement the intervention (Author,
279 2020), for teachers and school leadership staff delivering the intervention.

280 Teacher-led whole class lesson plans were developed to immerse *all* students in learning that aims to
281 improve students' interpersonal empathy and ability to display behaviours that help others participate and feel
282 included at school. School participation barriers identified in the MSPA were grouped into themes, which then
283 formed proposed lesson topics using a strengths-based approach. For example, staying on task, completing
284 worksheets, and following classroom instructions and routines were grouped into a theme called 'helping each
285 other in the classroom'. This lesson aims to support students to take the perspective of others who may find
286 learning in class more difficult, due to difficulties with skills such as attention, self-regulation, executive
287 functioning, and social communication. It aims to teach students how to recognise when a peer is having
288 difficulty in the classroom and practise ways to help and learn ways to ask for help themselves when they
289 needed it in class. Intervention techniques deemed effective for students on the spectrum such as peer mediation
290 (Chan et al., 2009), video modelling and role play (Thompson, 2014) were incorporated into lesson plans. For
291 example, role play was incorporated into the 'helping each other in the classroom' lesson, which involved an
292 activity in this lesson requiring students to take the perspective of students who have limited verbal
293 communication by trying to communicate what is written on a piece of paper to a partner without using any
294 words.

295 Peer involvement in interventions play a critical role in promoting social interactions and friendships and
296 creating communities where all students help each other learn (National Association of Special Education
297 Teachers, 2020). Peer involvement also allows interventions to be delivered within a child's natural
298 environment; providing ongoing opportunities for students to practice their social skills and increase the
299 likelihood skills will be generalised across settings (Chan et al., 2009; Watkins et al., 2015). While the whole
300 class component of the intervention aims to teach *all* students to be natural peer mentors, the peer training
301 component involves selecting a small number of peers with strong interpersonal skills to receive additional
302 teacher-led training prior to the commencement of the intervention, to support them to provide additional
303 support to target students in the classroom and playground.

304 Involving parents in school-based interventions reinforces complementary roles of families and educators
305 and extends opportunities for learning across contexts where students spend most of their time (Goldberg et al.,
306 2019). The parent component of the intervention involves weekly information handouts and inviting parents to
307 participate in intervention-specific activities. At a school level, literature recommends reinforcing core concepts
308 through non-curriculum-based activities in the school designed to promote a positive school climate (Minniss &
309 Stewart, 2009; Rowe, Stewart, & Patterson, 2007). The whole school component of the intervention includes
310 information for school leadership staff about the importance of school involvement for student outcomes
311 (Carrington et al., 2020; Goldberg et al., 2019) and activity ideas to incorporate key messages across the school.
312 Prior to further development, information was obtained from students, parents, educators, researchers and
313 clinicians via a reference group, focus groups (Author, 2020), Delphi study (Author, 2019) and online feedback
314 surveys to develop and further refine the intervention until it was ready to test in mainstream primary schools.

315 ***Regular consultation with a consumer and stakeholder reference group***

316 Throughout the intervention development process, a CSRG were consulted, which included an occupational
317 therapist, speech therapist, teacher, deputy principal and two parents of primary school students on the autism
318 spectrum. One parent, who had two primary school-aged children on the autism spectrum, also had a diagnosis
319 of autism herself and had a professional background in teaching. In the beginning, the primary author met with
320 the group to ask more general questions relating to research design and the readability of participant information
321 sheets. As the research progressed, the primary author met with individual members of the reference group as
322 required. For example, the deputy principal was consulted on ways to maximise school uptake of the
323 intervention, whereas parents were consulted on their preferred use of language in the autism specific lesson
324 plan and strategies to maximise parent engagement. The utilisation of a CSRG helped to understand consumers'
325 and stakeholders' lived experiences with research and school-based supports, which helped to identify perceived
326 barriers in implementing the intervention as well as problem-solve ways to maximise uptake of the intervention
327 and ensuing research (Mathie et al., 2014).

328 Primary school students with and without autism were also involved in co-designing and co-producing
329 intervention resources. For example, the school experiences of real-life students on the autism spectrum were
330 explored and documented in an edited documentary style video developed in collaboration with the (name of
331 organisation removed for peer review). Typically developing primary school aged students were also involved
332 in intervention development, acting in a series of interactive video resources for use in the whole-class
333 component of the intervention. Involving students in developing intervention resources was integral in ensuring

334 the authentic lived experiences of school aged students were addressed, and that resources were relevant and
335 suitable to end users (Consumer and Community Health Research Network, 2017)

336 *Focus groups*

337 Focus groups were used to explore the perspectives of parents and educators on the school participation of
338 primary school students on the autism spectrum and to seek recommendations regarding the content and
339 delivery of the intervention (Author, 2020). Four separate focus groups involving a total of 26 participants were
340 conducted in Perth, Western Australia. Two focus groups were conducted with a total of 15 parents of children
341 on the autism spectrum attending mainstream primary school. Two focus groups were conducted with a total of
342 11 educators including teachers (n=5), deputy principals (n=1) and learning support coordinators (n=5) who
343 reported having experience working with primary school students on the spectrum in a mainstream setting.

344 Parents and educators identified several intrinsic (e.g., students school connectedness and sense of self) and
345 extrinsic (e.g., school culture and educator attitudes, knowledge, and skills) factors impacting the school
346 participation of primary school students on the autism spectrum and emphasised the importance of developing
347 school-based interventions that focus on addressing the psychological aspects of students' school experience
348 (Author, 2020). More detailed findings are reported elsewhere (Author, 2020) and helped to verify and enrich
349 school participation barriers identified from the literature in the MSPA.

350 Parents and educators also provided general recommendations, which informed the overall approach of the
351 intervention as well as the content, dosage (i.e., frequency and intensity) and method of delivery of the
352 professional learning and whole class components of the intervention. Recommendations regarding ways to
353 increase uptake of the intervention from parents' and educators' perspectives were also provided.

354 Overwhelmingly, parents and educators felt the intervention should adopt a strengths- and differences-based
355 approach, focusing on raising students' awareness, understanding and acceptance of autism. Educators
356 emphasised the importance of embedding lesson content into the curriculum with specific reference to
357 curriculum outcomes in the manual and providing ideas on ways to individualise lesson content to the diverse
358 needs of students and classrooms. To maximise uptake of the intervention, educators suggested resources need
359 to be 'ready to go' with comprehensive lesson plans and printable resources to minimise burden for teachers
360 (Author, 2020). This information was used to develop a more detailed description of the intervention, including:
361 (a) a revised list of whole class lesson topics, (b) proposed content of professional learning, (c) weekly parent
362 information handouts, and (d) proposed method of delivery of intervention components. These findings helped
363 to guide avenues of questioning in the next phase of the research, which involved a national Delphi study.

364 *Delphi study*

365 Consensus from expert clinicians, researchers and educators was obtained on the content, delivery and
366 feasibility of the intervention using an online two-round national Delphi study. Round one (clinicians, n=34;
367 researchers, n=17; educators, n=25; total experts, n=76) focused on seeking expert opinion on the application of
368 the fPRC to students on the autism spectrum. This round also provided evidence to support the relevance of the
369 intervention, with all experts agreeing that improving the school participation of students on the autism
370 spectrum, is important enough to warrant the development of an intervention and that school connectedness is
371 not currently addressed in Australian curriculum. Round two (clinicians, n=27; researchers, n=18; educators,
372 n=20; total experts, n=65; response rate = 87%) focused on gaining expert opinion on the importance of
373 proposed whole class lesson topics and the feasibility of implementing proposed intervention techniques. More
374 than 90% of experts agreed with the proposed content for lesson topics and reported intervention techniques
375 were feasible or very feasible in the school environment. More detailed findings from the Delphi study are
376 reported elsewhere (Author, 2019) and helped to develop and refine intervention components. For example, the
377 Delphi study helped to determine that whole class lesson topics would be delivered in short (i.e., less than 60
378 minutes) regular sessions over the course of a term and that professional learning would focus on helping
379 teachers to apply intervention content to their classroom and discuss ways the intervention can be practically
380 incorporated into a school day.

381 *Feedback from students, parents, and educators on intervention resources*

382 Feedback on intervention resources was obtained from students, parents, and educators (i.e., teachers,
383 deputy principals, learning support coordinators) so that the intervention could be refined prior to a feasibility
384 study. Educators' perspectives were also obtained on proposed data collection methods for the feasibility study.

385 Worksheets from the whole class component of the intervention were trialled with five typically developing
386 primary school students for clarity of instruction and comprehensibility. These students were recruited using
387 convenience sampling through networks of the primary author. Minor alterations were made to wording and
388 formatting of the worksheets based on students' feedback. Authors planned to seek feedback on the intervention
389 from students on the autism spectrum, via online surveys and qualitative interviews, once the intervention had
390 been piloted in primary schools. After having first-hand experience with the intervention, students would be
391 able to reflect on their own experiences and provide feedback on how the intervention could be improved.;
392 avoiding hypothetical questions, which students on the autism spectrum can find difficult. Future iterations of

393 the intervention will incorporate feedback from students on the autism spectrum to refine the intervention and
394 improve outcomes in future research.

395 Weekly parent information handouts and the intervention manual were reviewed by parents and educators
396 respectively using online surveys. Parents and educators were recruited using convenience and snowball
397 sampling through networks of the primary author. Recruited parents and educators were also asked to identify
398 other potential parents and educators. Potential participants were sent an email with an invitation to participate.
399 Once they consented, the primary author sent through relevant intervention resources with a personalised link to
400 an online survey (Qualtrics XM, 2021). The survey asked participants to respond to statements about the
401 intervention resources on a 5-point Likert scale (1= strongly agree to 5 = strongly disagree). For example,
402 educators were asked to respond to statements such as “The manual was easy to read”, “I understood content of
403 lesson plans”, and “I understood the examples provided in the professional learning and how these examples
404 linked to the content”. Participants were prompted to provide reasoning for their responses if they selected
405 ‘neither agree nor disagree’, ‘somewhat disagree’ or ‘strongly disagree’.

406 A combination of quantitative and qualitative approaches was used to analyse survey responses. Survey
407 responses were imported into the Statistical Package for the Social Sciences (SPSS) (IBM Corporation, 2015)
408 software and anonymised prior to analysis. Descriptive statistics were used to report participants responses to
409 Likert scale items and agreement was reached (i.e., no changes were made to intervention resources) when more
410 than 75% of participants responded ‘strongly agree’ or ‘somewhat agree’ to survey items. Content analysis was
411 used to analyse participants written responses to identify recommended changes to specific intervention
412 resources.

413 Eleven parents and 10 educators provided feedback on the intervention. Seven parents had children in years
414 1 to 3 and three of the 11 parents had a child with a diagnosed disability. Five educators were teachers from
415 independent schools and six of the 10 educators had more than 10 years’ experience in their current role.

416 Parent feedback on weekly information handouts and proposed parent engagement was positive and
417 agreement was reached on all survey items (see SI Table 1). More than 90% of parents reported parent
418 information handouts were easy to read, that information was relevant and that they understood the content as
419 well as examples provided and how these linked to the content. More than 80% parents reported they felt they
420 could apply strategies at home with their children and that proposed methods of parent engagement were
421 appropriate. Two parents raised concerns in qualitative comments over the depth of information provided,
422 suggesting researchers condense and chunk information so that it is more visually appealing for parents.

423 Educators provided valuable feedback on the intervention manual, lesson plans, professional learning,
 424 and resources and agreement was reached on all survey items (see SI Table 2). All educators reported
 425 intervention resources were easy to read, engaging, that they understood the content and examples provided and
 426 that the type and depth of information were appropriate. Two of the 10 educators expressed concern that time
 427 allocated to lesson plans was unrealistic and reported time management would depend on teachers' skills and
 428 experience. Educators reported, however, that lesson plans were thorough and allowed for flexibility and that
 429 teachers were able to use their judgement to modify or extend students. All educators reported understanding the
 430 proposed methods of data collection for the feasibility study, however, expressed concern about the amount of
 431 time it would take to administer measures with the whole class. We used these findings to make changes to the
 432 intervention manual, such as emphasising key messages of each lesson, highlighting mandatory activities and
 433 opportunities for individualisation. We also reviewed data collection methods for the feasibility study and
 434 reduced the number of whole class measures to minimise burden for teachers.

435 **The resulting intervention: *In My Shoes***

436 Based on the above research activities, the school-based intervention, entitled *In My Shoes*, has been
 437 developed (Author, 2020). *In My Shoes* aims to improve the school participation of primary school students
 438 aged between 8 and 10 years (grades 3 and 4) on the autism spectrum and their typically developing peers. The
 439 intended outcomes of *In My Shoes* for *all* students are to:

- 440 a. increase understanding and awareness of differences in the way students experience autism and school
 441 (*i.e., preferences*)
- 442 b. increase feelings of being accepted, respected, included and supported by others in the school social
 443 environment (*i.e., school connectedness*);
- 444 c. increase self-awareness of strengths and differences and the strengths and differences of peers (*i.e.,*
 445 *sense of self*);
- 446 d. improve confidence in their abilities to recognise when someone needs help, how to help others and
 447 ask for help at school (*i.e., sense of self and activity competence*); and
- 448 e. improve students' interpersonal empathy and use of pro-social behaviours to include peers in the
 449 classroom and playground (*i.e., activity competence*).

450 Intervention outcomes are specifically linked to intrinsic student factors impacting school participation
 451 outlined in the MSPA (see Figure 1).

452 *In My Shoes* is designed to be delivered over the course of a school term (approximately 10 weeks) and
453 includes the following components: (1) standardised online professional learning and ongoing face to face or
454 online support for teachers and school leadership staff; (2) teacher-led whole class lesson plans; (3) peer training
455 for selected peers; (4) activity ideas to incorporate key messages across the whole school; and (5) weekly parent
456 information handouts and invitations for parents to participate in the intervention. Intervention resources are
457 made available to schools on a USB memory stick and include professional learning video presentations, an
458 online interactive PDF manual, printable lesson plans, worksheets and resources, and interactive video resources
459 with real-life students on the autism spectrum sharing their school experiences.

460 *The professional learning component* encompasses all intervention outcomes, aiming to support teachers'
461 understanding of the content of *In My Shoes* and increase their capacity to utilise intervention techniques to
462 support the school participation of students on the autism spectrum. The professional learning component
463 includes supplementary pre-reading material detailing school participation barriers that result from
464 characteristics of autism and evidence-based intervention techniques to support students on the autism spectrum
465 in the classroom. Additionally, the resources include four pre-recorded video presentations (ranging from 4 to
466 24 minutes) of the primary author explaining the intervention and providing practical demonstrations of
467 intervention techniques such as video modelling. Teachers are encouraged to complete a pre-post professional
468 learning questionnaire that evaluates their adherence to reviewing supplementary material and the intervention
469 manual, as well as their confidence in delivering specific components of the intervention. The purpose of these
470 questionnaires is to identify teachers' perceived barriers to implement the intervention so that the primary author
471 can provide targeted support to teachers. School leadership staff involved in supporting teachers to deliver the
472 intervention (e.g., deputy school principals, school psychologists or learning support coordinators) are also
473 encouraged to complete the professional learning so that they can adequately support teachers and assist in
474 implementing the whole school component of the intervention. The primary author then organises follow up
475 online or face-to-face meetings with teachers and school leadership staff to clarify any components of the
476 intervention and to help teachers apply concepts in their classroom.

477 *The whole class component* includes 10, 45-minute lesson plans designed to be delivered by the classroom
478 teacher to the whole class (see Figure 3 for an overview of lesson topics). Each whole class lesson plan is
479 designed to target *specific* intervention outcomes. Some lesson plans focus on targeting one intervention
480 outcome, whereas others target several intervention outcomes. Over the 10 lesson plans, all intervention
481 outcomes are targeted several times using a range of evidence-based intervention techniques including role play

482 and video modelling, as well as educational practices identified to be feasible by educators (e.g., worksheets,
483 whole class discussion). The whole class component starts by helping students to increase self-awareness of
484 their strengths and differences and that of their peers (*i.e., sense of self*); focusing on celebrating student
485 differences; reflecting on how each student adds value to the classroom, and identifying behaviours that make
486 peers feel included, accepted, and valued for their differences (*i.e., school connectedness*). Students then learn
487 about autism and how students on the autism spectrum experience school, hearing real-life students'
488 perspectives on a documentary style video. Lessons then progress to teaching the core concept of the
489 intervention, 'look, think, decide', which teaches perspective taking and social problem-solving skills by
490 helping students to recognise body clues and how to use these clues to deduce what someone else might be
491 thinking and feeling so that they can decide on the best course of action to help peers participate and feel
492 included. Students are asked throughout the intervention to reflect, using interactive video resources and comic-
493 strip style illustrations, on what they would think or how they would feel if they were in a particular character's
494 shoes and what they think the character should do to support their peers in different situations. Each lesson aims
495 to teach these skills with a particular context in mind; for example, how to recognise and support peers in the
496 classroom versus the playground versus school organised events such as excursions, assemblies, or sports
497 carnivals. Finally, lesson plans highlight opportunities to incorporate students' preferences by building
498 connections with peers who have similar interests and encouraging teachers to incorporate students' strengths
499 and interests into activities wherever possible.

500 The content of whole class lesson plans align with social emotional learning principals, which are an
501 integral part of education and human development (Jones & Bouffard, 2012; Pasi, 2001); supporting students to
502 acquire and apply knowledge, skills and attitudes to develop healthy identities, manage their emotions, feel and
503 show empathy for others and establish and maintain supportive relationships at school. Links to state and
504 national curriculum and social emotional learning competencies are explicitly referred to at the beginning of
505 each lesson plan for teachers' assessment and reporting requirements. Teachers are also provided with examples
506 in the intervention manual on ways they can adapt or individualise lesson plans, in line with principals of
507 universal design (Center for Applied Special Technology, 1998; Orkwis, 2003), to meet the diverse learning
508 needs of students in their classroom. Refer to SI Table 3 for an example of a whole class lesson plan, detailing
509 target intervention outcomes, specific objectives and method of delivery.

510 *The peer training component* of the intervention focuses on supporting selected peers to further build on
511 their interpersonal empathy and use of pro-social behaviours (*i.e., activity competence*) to support students in the

512 classroom and playground. This component of the intervention includes information about the benefits of peer
513 involvement in school-based interventions and guides the teacher to carefully select three to four students in
514 their class who consistently attend school, have a history of being reliable and responsible, may be interested
515 and willing to help peers, have strong social and interpersonal skills, and have similar interests to target
516 students. Selected peers participate in a teacher-led short informal discussion-based training in the first week of
517 the intervention. The content of the training focuses on helping students to identify when someone looks lonely
518 in the playground or are having difficulty in the classroom, and what they could do to help in these situations.
519 The training draws on students' previous experience and helps to highlight ways they may be able to help their
520 peers at school.

521 *The whole school component* of the intervention includes information about the importance of school
522 involvement for intervention outcomes, as well as recommended activity ideas to incorporate key messages of
523 the intervention across the school. Activity ideas include example themes for assembly items, inserts for school
524 newsletters about key messages of the intervention, and recommended books and resources for a library space
525 about autism and neurodiversity. The whole school component aims to target all intervention outcomes over the
526 course of the intervention. For example, an assembly item about ways students can make peers feel more
527 accepted, respected and included at school would target the *school connectedness* intervention outcome,
528 whereas a library space about autism would target the *preferences* intervention outcome by aiming to increase
529 students understanding and awareness of autism.

530 *The parent component* of the intervention encompasses all intervention outcomes aiming to support parents
531 to increase their understanding of the content of *In My Shoes* and ways they can support generalisation of skills
532 in the home environment. This component includes weekly information handouts sent by teachers to parents
533 detailing lesson content and regular opportunities for teachers to invite parents to participate in intervention
534 specific activities. Teachers are also encouraged to check-in regularly with parents about their understanding of
535 parent information handouts and provide regular feedback about students' learning via photos or videos on
536 school portals.

537 *[Insert Figure 3 here]*

538 **Implications for research and practice**

539 The imperative to develop a school-based intervention to improve the school participation of students
540 on the autism spectrum arose from growing literature on the long-term negative impact of reduced school
541 participation on student outcomes (Furlong et al., 2003; Maddox & Prinz, 2003; Shochet et al., 2006). We

542 designed *In My Shoes* based on our own theoretical model of school participation and autism and a series of
543 research activities, which aimed to gain iterative feedback from students, parents, educators, clinicians, and
544 researchers with expertise in the topic area. The MSPA was imperative in defining constructs of interest to be
545 targeted in the intervention and ensured the intervention was rooted in theory and evidence. Each step in the
546 research process offered valuable comments and revisions to shape the intervention.

547 To participate at school, students need to have necessary skills and abilities, have self-determination,
548 positive self-esteem and feel confident and satisfied in their abilities at school, feel accepted, respected,
549 included, and supported by teachers and peers, and have interests or activities that hold meaning to them
550 (Author, 2020; Author, 2019). Rather than focusing on school participation barriers or students' skills in
551 isolation (illustrated from left to centre in Figure 1), *In My Shoes* utilises a strengths-based approach to
552 holistically promote school participation enablers using evidence-based intervention techniques (illustrated from
553 right to centre in Figure 1). The deliberate decision to immerse *all* students, not just those on the autism
554 spectrum, in learning that focuses on behaviour and knowledge change, was important in shifting perceptions
555 that students' school participation occurs in isolation. More accurately, that it is a collective effort of all
556 individuals within the school environment to help others participate and feel included at school. Framing lesson
557 content around the tasks, activities and routines in which students participate, rather than the skills they need to
558 participate, shifts the focus away from individual performance components; thereby allowing us to adopt a more
559 functional approach to support student school participation. In this way, we can focus on how individuals within
560 the environment can support each other to learn new skills, build positive self-esteem and feelings of being
561 accepted, respected, and included at school.

562 The involvement of consumers was crucial in developing and refining the intervention (Consumer and
563 Community Health Research Network, 2017). Expert recommendations from the Delphi study (Author, 2019)
564 and feedback on intervention resources from students, parents and teachers invaluable in providing practical
565 suggestions to ensure the intervention would be relevant, appropriate, and meet the needs of end users. Although
566 we received feedback from many stakeholders including students, one that could have been improved was that
567 of students on the autism spectrum. We plan to seek feedback from students on the autism spectrum once the
568 intervention is piloted in primary schools; this way, students can reflect on their own experiences and provide
569 feedback to improve the intervention and the potential outcomes of future research. We also suggest future
570 research aims to form a working party of students on the autism spectrum across year levels to provide feedback
571 on the intervention and its resources. This would help to better understand students' lived school experiences

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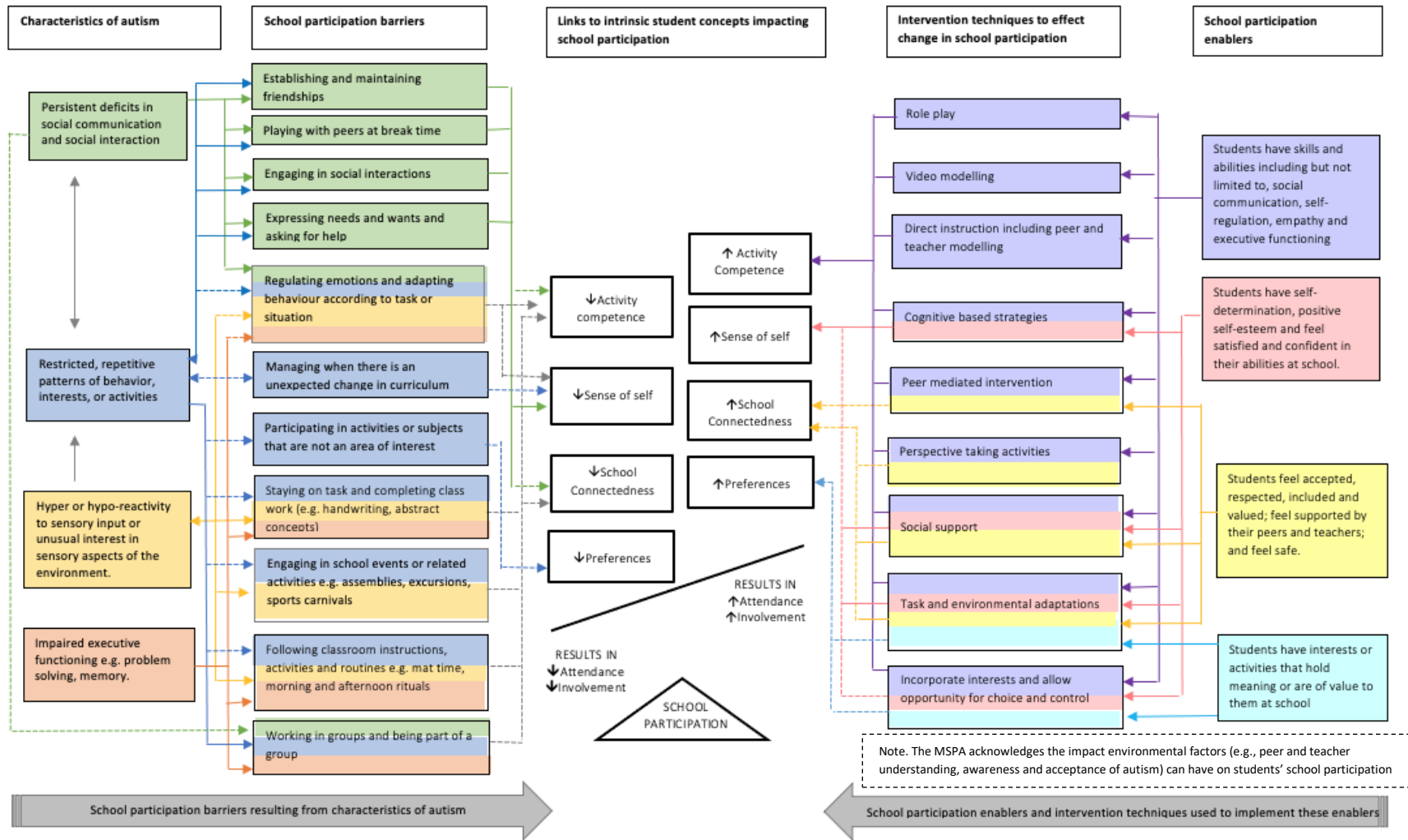
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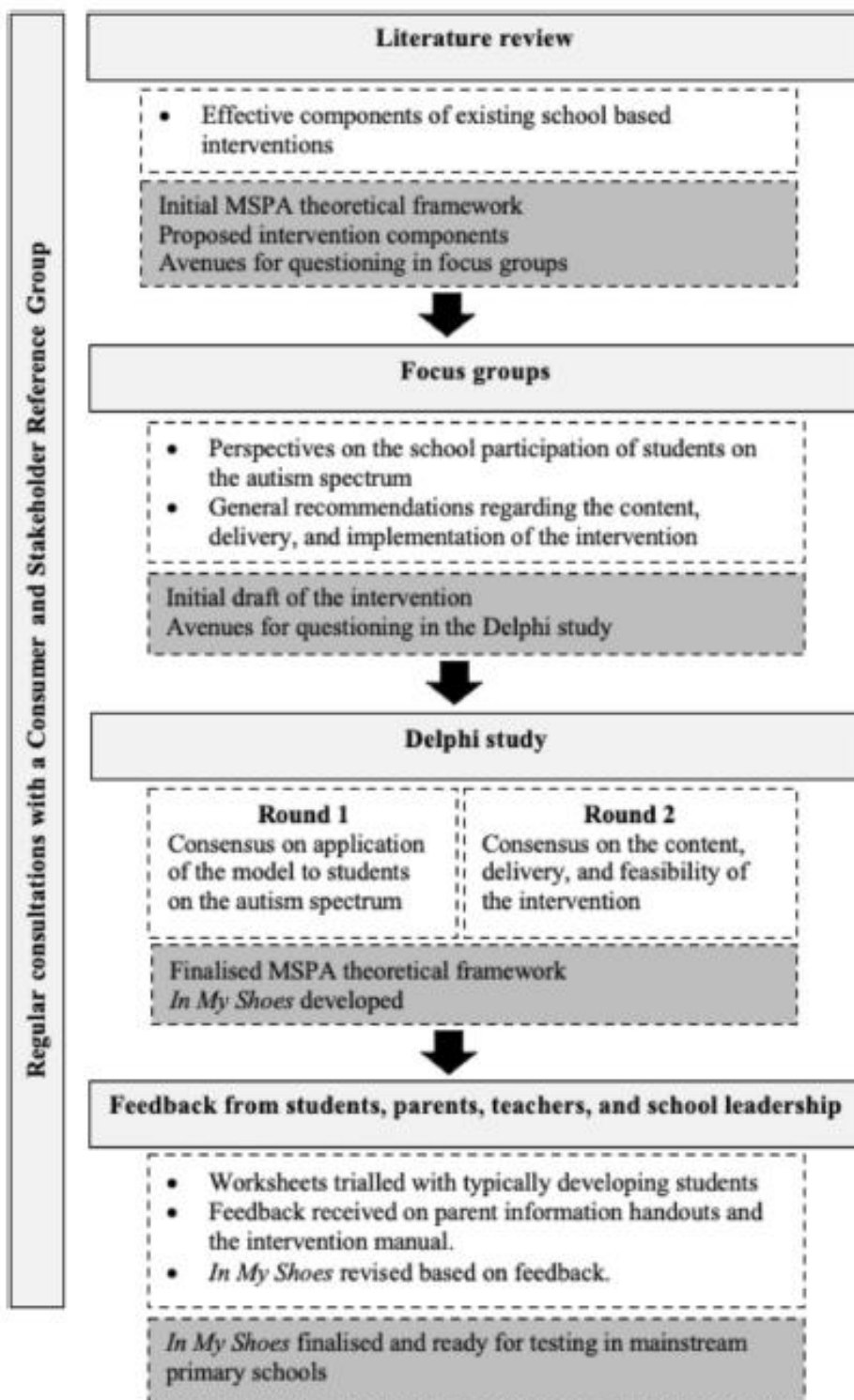
819 Fig 1. The proposed model of school participation and autism (MSPA)



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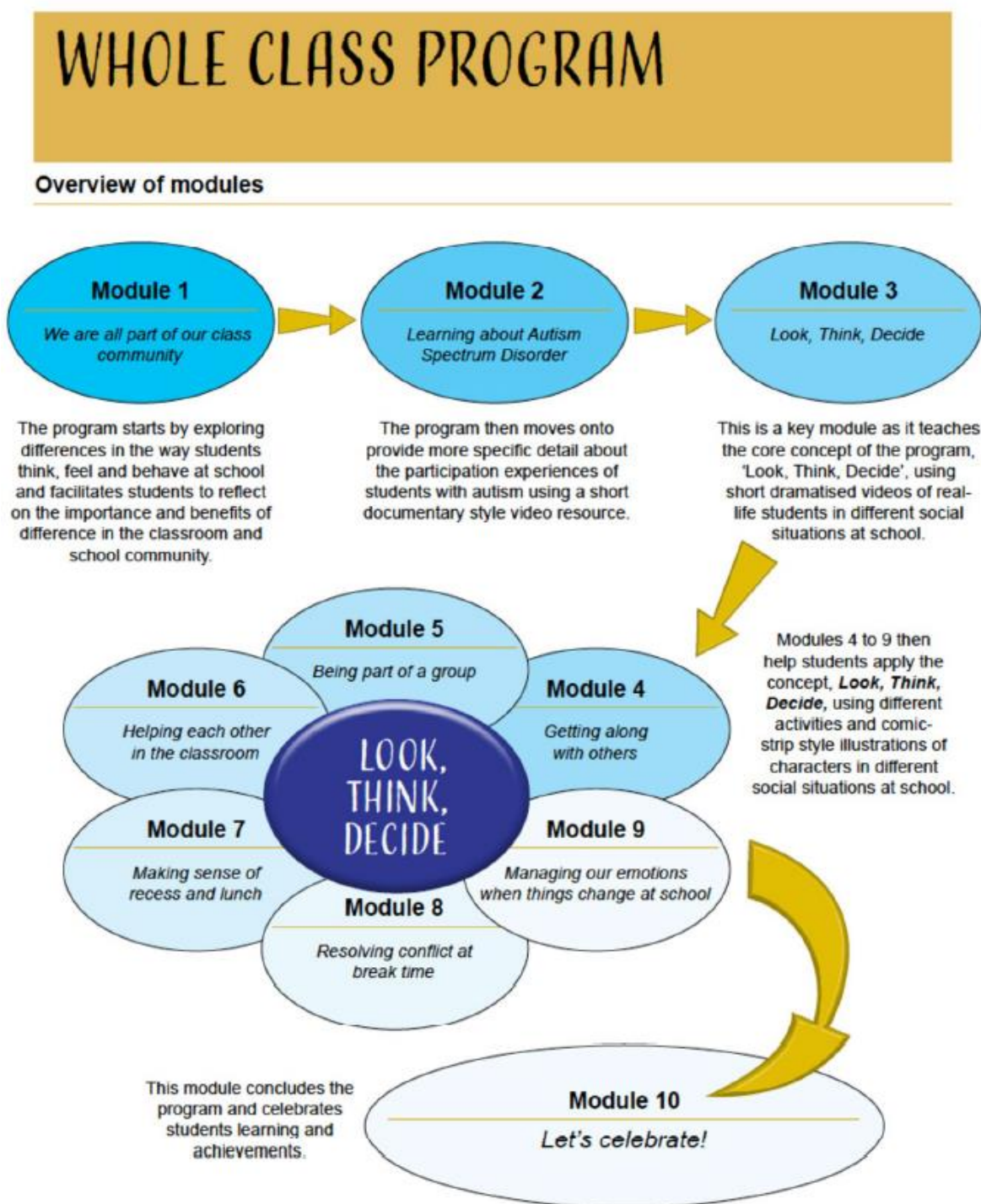
822 Fig 2. Multi-stage iterative process of intervention development



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825 Fig 3. Overview of whole class lesson topics



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