Review Article

Delivery of Group-Early Start Denver Model in an Australian early childhood setting–a Narrative Review

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Background and Objective: This article provides an overview of the Group-based Early Start Denver Model (G-ESDM), an early intervention approach for young children with autism spectrum disorder (ASD). The G-ESDM is based on the delivery of the evidence-supported Early Start Denver Model (ESDM) techniques in group-based settings such as early learning and care settings, with one adult delivering instruction to small groups of three to four children. We review principles, strategies and empirical support for the G-ESDM, as well as challenges and future directions.

Methods: We examined principles, strategies and empirical support for the G-ESDM.

Key Content and Findings: The program is informed by research documenting the positive impact of early interaction with peers and preschool experiences for social-cognitive development, and is designed to maximize cost-effectiveness by providing evidence-based treatment during daycare hours. ~~Additionally, it~~

Conclusions: The G-ESDM program is designed to provide a delivery format that is both effective and sustainable and to capitalize on (a) the culturally universal tradition of educating young children in group settings, and (b) the social learning opportunities provided by peers. There is initial empirical evidence supporting the feasibility and effectiveness of the program. Questions to be addressed in future research include the community viability of this model in areas serving low income families, as well as the durability of activities and resources after initial funding and training.

Keywords: Autism; early intervention; Early Start Denver Model (ESDM); Group-Early Start Denver Model (G-ESDM)

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With sustained increases in diagnoses of autism spectrum disorder (ASD) (1), currently at approximately 2% of the population, there is a concomitant need for the delivery of early intervention to maximize learning opportunities during the period of maximal brain plasticity (2,3). Both practitioners and researchers recognise that intensive early intervention is beneficial for autistic children (4,5), and currently recommended approaches include the Early Start Denver Model (ESDM) (6,7), a comprehensive manualized intervention approach suitable for children as young as 12-month of age. This model, based on developmental and behavioural science, has been shown to be efficacious in improving cognitive, adaptive, and communicative outcomes in young autistic children (8,9) when delivered for a minimum of 15-to-20 hours in a 1:1 (trained therapist: child) fashion.

A naturalistic developmental behavioral approach (10), the ESDM employs a transdisciplinary team to address a

wide range of challenges faced by young autistic children, including a focus on affect, attention, motivation and arousal. ESDM intervention strategies can be applied to interactions with adults and peers, such as utilising children's interests and strengths, building joint activity routines, amplifying the social-affective and communicative elements of social interactions, and embedding learning opportunities in meaningful and motivating everyday routines (6). Thus, it is based on teaching skills that are foundational to social-cognitive development, with the idea that intensive participation in socially rewarding shared experiences leads children to become more attuned to their social environment, thereby increasing natural learning opportunities. Therapy can take place in any setting (clinic/home) that children find themselves in, including early learning and care settings.

Individualized learning objectives in ESDM are created from a careful assessment of the child's strengths and weaknesses based on the ESDM Curriculum Checklist (6), a developmentally sequenced tool which evaluates functioning level across several developmental domains, including receptive and expressive communication, social skills, play skills, cognitive skills, joint attention, gross and fine motor skills, and adaptive skills. Progress is systematically monitored and mastery of all objectives is assessed every 12 weeks, with new learning objectives generated based on the assessment results.

While 1:1 intensive early intervention is the most frequently researched and implemented method of delivery for autistic children, there are potential barriers to delivering such programs, which include costs and demands on parent's time (e.g., the need to stay home when children receive in-home individualized intervention). One approach designed to addressing these barriers is group delivery of the ESDM (G-ESDM), which has been found to be associated with positive outcomes using quasi-experimental designs (11-13). The G-ESDM has been manualized, and its delivery will be the focus of this chapter.

Methods

We examined principles, strategies and empirical support for the G-ESDM.

Goals of the G-ESDM approach

The G-ESDM is designed to provide a feasible and sustainable empirically-supported early intervention for young autistic children, implemented in specialist or inclusive early learning and care group settings. In the G-ESDM, children receive frequent high-quality learning opportunities within these settings, so that they can build a behavioral repertoire that supports further learning and fosters social-cognitive development. Learning opportunities are based on delivery of the evidence-supported ESDM practices, with individualized treatment objectives derived from the distinctive profile of strengths and needs of each child.

The G-ESDM is informed by research documenting the beneficial effects of early interaction with peers and preschool experiences for social-cognitive development in typically developing children. According to this literature, the opportunity to practice complex social and cooperative behaviours during play routines with peers supports the development of social-cognitive, social-emotional and communicative skills (14). Additionally, high-quality childcare environments that promote engagement in joint activities with peers have been found to positively impact on social and communication development (15,16). The G-ESDM aims to provide children with ASD with the social and learning opportunities offered by interactions with adults and peers in high quality early learning and care environments during early development.

Another important rationale for implementing early intervention in the context of existing community settings and programs, for example childcare, preschool and playgroup settings, is to facilitate families to maintain work and routine commitments while their child receives intervention (17). Research indicates that frequently the combined challenges of accommodating early intervention schedules and obtaining childcare services faced by families result in caregivers moving from full- to part-time employment, or withdrawing from the workforce altogether (18). Forced departure from the workforce and the consequent reduction in income can impact on the child's service needs and on family mental health, wellbeing and quality of life.

The approach of delivering early intervention within a preschool or childcare environment is also consistent with the culturally universal tradition of educating young children in group settings, and enables families to participate in community programs and settings similar to other families in their local community. Autistic children and their families are at a high risk of experiencing stigma and social isolation because of their disability (19), and their involvement in community programs may reduce the risk

of social isolation, while also increasing understanding of autism, and supporting inclusive practice across the broader community.

An additional benefit of the group environment is that it facilitates opportunities for autistic children to learn alongside their peers. Preschool and childcare programs emphasise the development of social skills as part of early education, including through facilitating opportunities to engage in meaningful and reciprocal play and daily routines with peers, which provide a rich opportunity to embed the individual ESDM objectives for a child. Additionally, this enables the opportunity for children without ASD to learn about differences among people and appreciate diversity from an early age.

The National Research Council (5) observes that the fundamental objective of education, across typically developing and autistic children, is to support the development of personal independence and social responsibility. Group-based early intervention potentially provides greater opportunities than 1:1 model to achieve this goal through opportunities to target not only the child's individual objectives, but also the preschool/group curriculum and the implicit (often unstated) social curriculum. The overarching goals of the G-ESDM are to support children's active participation in group activities during play and daily routines and foster their ability to use communication with peers and adults during play and daily routines, negotiate transitions independently and acquire the behavioural infrastructure of social-communicative and cooperative skills that will enable them to participate in subsequent learning environments (6,17).

The following vignette illustrates how individual treatment objectives are targeted within group activities in the G-ESDM.

Alison (teacher) is leading a drawing activity in her classroom. Three children, Tom, My and Lee, have decided to join her. Alison observes Tom dotting with his marker, consistent with his treatment objective of imitating different pencil strokes, and begins to imitate him dotting. My has an objective of responding to 'look,' and Alison, wanting to create an opportunity for peer interaction, says "look" while pointing to Tom drawing. Now that the children are engaged in 'dotting' with Alison, she pauses and models drawing a line for Tom to imitate; he does so. Lee has a treatment objective of following two-step instructions, so Alison positions the pencil jar in front of him and asks Lee to "*pick up the pencils and give them to My*", as a means of facilitating peer interaction in addition to Lee's individual objective.

Treatment techniques

In the G-ESDM, measurable treatment objectives tailored to each child's individual needs are generated every 12 weeks, based on the ESDM curriculum checklist assessment; these objectives are then targeted within the constraints and opportunities provided in the group setting. Group routines are organized around clear, predictable, and shared goals, and designed to bring children together in the same physical space to provide naturalistic learning opportunities. These are embedded within emotionally engaging experiences that involve culturally relevant activities and play materials that children typically encounter in their everyday environments, such as art table activities, book activities, "sensory" games with water, sand, and shaving cream, group music and movement games such as Ring-around-a Rosie, parachute games as well as table games in which the children need to share and pass materials, or help each other.

Activities are designed to facilitate face-to-face interactions and children are provided with duplicate objects to encourage imitation and peer interaction. In this context, the role of the adult is to organize group-based joint activity routines, i.e., activities that provide opportunities to do things together and learn from such experiences (20). These are articulated in four stages, including (I) a set-up phase, in which children choose the activity among different options made available by the adult; (II) a theme in which the child and the play-partners participate equally in the activity chosen by the child (e.g., by taking turns), creating a predictable and enjoyable routine; (III) an elaboration that expands the theme; and (IV) a closing phase that marks a clear ending for the current activity followed by a transition to the next activity.

For example, a child might be independently building a tower with Lego (set-up phase) and the adult observes and then joins in, offering pieces to the child to add to the tower, and taking turns to add pieces to the tower. Other children are also encouraged to join in and the adult and children take turns adding pieces to the tower, passing pieces to each other and crashing and rebuilding the tower (the theme phase). As one child in the group starts engaging in a different action with the same material, for example driving a car into the tower to knock it down, the adult points that out and prompts other children to do the same or to build on this idea, for example by seating a driver in the car, adding sound effects and so on (elaboration phase).

When the activity becomes repetitive, or children start to lose interest, the adult encourages children to put away the Lego pieces, and transition to the next activity (closing phase).

The goal of joint activity routines is to address both areas of difficulties that characterizes autism: the social impairment by facilitating joint engagement, and the flexibility difficulties by systematically introducing variations on the play activity. Additionally, the repeated engagement in meaningful and rewarding joint experiences in close proximity to the peers under the guidance of the adult provides the framework for targeting and practicing key behaviours across developmental domains, including expressive and receptive communication, turn taking, imitation, sharing of affect, joint attention, functional and symbolic play, and motor skills.

These objectives are addressed through evidence-based instructional techniques based on naturalistic developmental behavioural approaches (10), including the use of "Antecedent–Behaviour–Consequence (ABC)" contingencies, shaping, fading, prompting, chaining and error correction procedures, peer-mediated teaching, management of affect, arousal, and motivation, and the use of warm, playful shared interactions as a context for learning (17).

Decision trees are used to readjust the program when child progress is slower than expected in one or more developmental areas. Modifications might include increasing the number of teaching episodes delivered to the child during group activities, organizing 1:1 focused teaching sessions in a distraction-free environment, increasing reinforcer strength, and introducing augmentative communication tools such as visual schedules or speech generating devices. Importantly these modifications are introduced on a needs basis depending on child progress as assessed at 12-weekly intervals.

There are several fidelity tools (17) used to determine whether the program is being delivered according to the G-ESDM implementation standards. These include the ESDM fidelity tool (6) and the G-ESDM small—group tool and Classroom Measure (17). Fidelity is checked at regular intervals throughout the program with a target of 80% fidelity.

The transdisciplinary G-ESDM team

Like the ESDM, the G-ESDM involves a transdisciplinary team typically comprising early childhood teachers, educators and Allied Health clinicians (Occupational Therapists, Psychologists and Speech and Language Therapists). Each member of the team is trained on the 1:1 ESDM and G-ESDM, with some members completing the formal training process to achieve certification as ESDM therapist, and others who are not certified, but work as 'para-professionals'. All team members are responsible for a significant portion of direct delivery of the model, and it is therefore crucial that they are appropriately trained and supervised on an ongoing basis. Some children may also need external support from a developmental pediatrician and/or child psychiatrist who are not part of the G-ESDM team.

All team members contribute their expertise to the overall G-ESDM program through their specialist area. Early childhood teachers contribute their expertise through the development of the curriculum, which incorporates each child's individual ESDM objectives. Teachers are highly skilled in differentiating the curriculum across all children, setting up the room environment to maximise learning opportunities for each of them, developing room schedules, as well as supervising and coordinating staff and liaising with families daily. A specified 'Room Leader' (typically a teacher) manages the daily implementation of the G-ESDM program in consultation with the education and Allied Health team, which varies in adult-to-child ratio across the day, according to the planned activity and daily schedule, usually between 1:2 and 1:3 (adult: children).

The Allied Health clinicians contribute to the G-ESDM program in two fundamental ways; the first is through their specialist expertise, with each clinical specialist contributing to a greater understanding of child development across specific developmental domains, supporting the creation of the G-ESDM curriculum and program. Secondly, their specialist skills are utilised to support the needs of individual children as required, through an internal referral process.

The varied specialist expertise of the G-ESDM team presents as both an opportunity and a potential challenge as it involves the need to provide adequate support to team members with diverse backgrounds. In doing so, is it critically important to rely on the manualized G-ESDM procedures, which provide a cross-disciplinary paradigm and language, while also continuing to support and maintain each of their specialist areas of expertise.

The transdisciplinary approach used in G-ESDM is based on the distinctive features identified by King *et al.* (21), including intensive and ongoing collaboration amongst all staff, which creates opportunities for informal learning through the constant exchange of knowledge and skills and 'releasing' intervention strategies specific to each

professional area of expertise to support a child's individual program. This is achieved through the transdisciplinary format of the G-ESDM training and supervision model, which is based on the implementation of techniques informed by multiple disciplines. This feature promotes the child's ability to generalise a behaviour cross multiple contexts and people, including parents/caregivers who can also be trained on specific intervention strategies. Importantly this approach also enhances opportunities for professional development.

The G-ESDM curriculum

Developing individual programs

When selecting objectives for the G-ESDM, it is important to consider the opportunities (and limitations) of the group environment. The objectives selected emphasise the development of independence and participation within the group environment. For example, a child may need an objective to verbally request 'help' from adults. However, in a group environment, an adult may not be directly attending to that child when s/he needs assistance. Thus, additional skills must be taught to ensure the child can have their needs met within a group setting. The child may also be taught to cross a distance to find an adult, or to tap an adult to gain their attention. A benefit of this approach is that the learned behaviour supports the child when they transition to new group settings or participate in group experiences in the community, for example at birthday parties.

Curriculum planning and the daily schedule

A young child's day is typically made up of a series of routines, such as eating, bathing, dressing, toileting and sleeping, interspersed with periods of play. As opposed to viewing specific times of the day as "therapy time", in the G-ESDM, like the ESDM, every routine is viewed as a teaching opportunity. Consequently, team members target and teach multiple objectives from multiple domains across every part of the child's day through strategic curriculum planning.

There are several components to curriculum planning in the G-ESDM, including developing activities that target a range of children's objectives, the development of a daily schedule, and the allocation of clear roles and responsibilities across team members. When developing a G-ESDM curriculum, consideration is given to both incorporating multiple objectives across multiple children and to child motivation. It is important to note the complexity of this and the numerous components that must be considered; for example, ensuring that the activity is appropriately differentiated for each child, ensuring that all resources are appropriately prepared, and ensuring that transitions for all children to, from and between activities is considered. To ensure activities are implemented at an optimal level, lesson planning templates are used and 'cheat sheets' summarising children's objectives in one activity or routine are displayed around the classroom to assist staff.

The development of a daily schedule is also an important part of the curriculum planning process. The daily schedule reflects what is typical of a young child's day in a preschool or daycare setting, and allocates time to daily routines (for example, meals), structured small and large group activities, unstructured play activities (for example, during the morning drop off period), indoor and outdoor time and so on. A benefit of the daily schedule is that it supports children, and the team, to predict what is going to occur throughout the day, thereby supporting children to engage in goal-directed behaviour, while also replicating the daily schedule of generalist preschool programs.

As discussed earlier, implementing the G-ESDM relies on a high degree of collaboration between team members, which includes clearly defined roles and responsibilities across the daily schedule to optimise children's learning opportunities, and the unhindered implementation of the G-ESDM across the multiple staff and children. In addition, we have developed and defined roles and responsibilities within curricular experiences, as follows:

(I) Float: during structured play activities the 'float's role is to monitor the overall playroom, and to support sustained engagement in activities, including through redirecting children to an activity lead by a staff member (i.e., if they are not engaged in goal directed play). The float ensures that teaching can remain focussed while all children are supported to access curricular experiences.

(II) Lead: the lead is the adult responsible for facilitating the curricular experience. She is responsible for engaging and maintaining children's interest throughout the experience to maximise learning opportunities for individual children across the group, including observing and responding to children's cues and targeting individual objectives throughout the experience.

(III) Invisible support: the 'invisible support' is used

during activities in which children are expected to attend to one adult (the 'lead'), e.g., during small circle group activities and mealtimes. The purpose of the invisible support role is to facilitate children's participation in these activities without detracting their attention from the lead.

(IV) Supporting transitions: in the G-ESDM, transitions are accomplished using the 'lead-bridge-close' transition procedure (6,17), which involves a 'lead' to open the activity (e.g., getting materials out) and draw children's attention toward the new experience; a 'bridge' to support children to move from the previous activity to the new activity; and a 'close', to pack away materials from the previous activity and assist the last child/ren to transition to the new activity. For example, at lunchtime the lead will 'open' the lunch activity by helping the first 1–2 children to wash their hands, independently walk to the lunch table and sit down; the 'bridge' supervises the remaining children to wash their hands and independently transition to the lunch table, and the 'close' will close down the previous activity and may help any remaining children to wash their hands and sit at the table.

The G-ESDM classroom

The G-ESDM classroom should look much the same as any well organised preschool classroom, with areas organised around different purposes. The physical arrangement and the materials presented in the area should indicate clearly what their purpose is. Having an environment where there is clear meaning attached to each space is crucial to facilitate children's intentional, goal-directed behaviour. However, while the different areas in the classroom and the materials involved in each area have clear purpose, the specific activity in each area is not predetermined. Therefore, there are no "work schedules" telling the child what to do with each toy. Rather, consistent with principles of Montessori (22), within each area, children are able to choose between different materials made available to them, which are consistent with the theme of the activity and purpose of the area. Materials and experiences that appeal to children's specific interests are included and individualised to maximise their motivation and participation.

Autistic children often have difficulty with attention and can be easily distracted by competing stimuli (23). Therefore, the G-ESDM environment is purposefully constructed to direct children's attention to their peers and adults. The environment and materials are used to create visual cues to support children's understanding of what routine or learning experience is occurring, and to eliminate the competition of their surrounds. For example, a therapist may pack away or cover other play areas in the room and lay out the meal-time table cloths to signify the start of a meal routine. Therapists can make use of furniture, cloths, partitions and chair placements to direct children's visual attention to specific adults or tasks, as required.

Facilitating peer interactions

All children, including autistic children, have the right to receive an education in the least restrictive environment, incorporating consistent opportunities for interactions with typically developing peers (5,24). Social interactions amongst young children (referred to herein as 'peer interactions') offer invaluable opportunities for developing, extending, and generalising skills across many areas of development. Examples include expressive and receptive communication, play, imitation, joint attention, self-regulation skills, and social skills including turn taking and sharing (5,25). Peer interactions are an important context in which young children learn foundational skills in developing and maintaining friendships, which support their health and well-being across the lifespan (26). Designed to extend young children's early learning and socialization, preschool settings provide a supportive learning environment to facilitate peer interactions within daily routines, such as meals, play, and social games (27). The multitude of bi-directional learning opportunities within peer interactions is unique and not interchangeable with the learning opportunities available from children interacting with an adult (17,25).

However, placement of autistic children into an inclusive preschool class is not sufficient to foster meaningful, rewarding social interactions as children with ASD encounter multiple barriers to engaging in peer interactions due to their social-communicative difficulties and behavioural rigidity. Staff training and evidence-based teaching strategies tailored to the complex strengths and needs of each individual child are needed. In G-ESDM, these barriers are addressed by designing and targeting goals that include continuing play when a peer joins in parallel, engaging with a group of peers and adult in a motivating activity, and attending to a peer's play, communications, and emotions. Later skills include imitating peer's actions and communications, initiating and responding to joint

attention bids (e.g., showing or giving/taking items), and responding appropriately to other social initiations such as greetings and requesting a turn. For example, Joe is supported to continue driving the trains when Annie joins the play space; the adult supports Annie to notice and then imitate Joe's play actions, and Carl who is nearby is provided opportunities to ask for a turn and then pass back the train driver later in the joint activity routine. Finally, complex skills such as conflict resolution and understanding and coping with strong emotions (e.g., frustration, jealousy, impatience) are other teaching targets. Given the comparative social strengths of typically developing children, inclusive preschool settings are the ideal learning environment for supporting young children with autism's peer interactions and social learning (17,28).

Programmatic evaluation

Given the numerous components that make up the G-ESDM, ongoing and systematic programme evaluation is fundamental to ensuring best practice service delivery. This includes, among other aspects, implementation and evaluation of training programs and adherence to fidelity across multiple contexts of delivery. To ensure that all team members are providing optimal therapy to children, manualized guidelines used in G-ESDM include:

- The training program be developed and implemented by two or more staff who have the highest level of clinical experience in G-ESDM/ESDM. This strategy allows the training team to collaboratively review the training program and discuss strategies for team members who require additional training;
- To implement fidelity checks regularly across all staff and as part of the team member's role; i.e., while the team member is engaged in their role, the fidelity check is carried out;
- That the fidelity results inform the training program. Fidelity and training are critically linked and require constant assessment to maintain best practice;
- That fidelity checks are carried out across all team members across all delivery contexts: 1:1, small group, and whole group. This ensures all team members are familiar with all G-ESDM fidelity tools (17).

Empirical support

Empirical support for the G-ESDM includes a quasi-experimental study (13) documenting the implementation of the G-ESDM program in community a childcare setting in Melbourne, Australia, with results showing superior outcomes in language and cognitive functioning for 27 children receiving the G-ESDM for 1 year, 15 h per week, compared to an age- and IQ-matched control group enrolled in a different childcare-based intervention program that was similar in intensity and duration. Additional research documented that children with younger chronological age and more advanced skills in object play, joint attention, and imitation experienced the largest gains (3,29) from their G-ESDM program. A recent randomized trial in the same G-ESDM setting also showed that early childhood educators were able to implement the program at high degree of fidelity; Importantly, children experienced benefits in social, verbal and adaptive functioning both when the G-ESDM was delivered in specialized childcare settings (classrooms including only children with ASD) and inclusive childcare settings (classrooms involving mostly typical children), with similar child outcomes across settings (28). As reported in the same study, an independent standardized evaluation indicated that quality of teaching and care in the childcare settings where the G-ESDM was delivered was well above the national average for Australia, suggesting that delivery of the G-ESDM improved the quality of teaching and care provided to all children involved (both those with and without autism). Further research from a different setting in Australia that used a pre-post design documented increases in developmental rates and decreases in challenging behaviors for children receiving the G-ESDM (11,12).

Additionally, the G-ESDM has been piloted in Israel, with preliminary results of a quasi-experimental study with closely matched groups showing that developmental and adaptive outcomes of 27 children receiving the G-ESDM were superior compared to those of 25 children receiving usual care (30).

Conclusions

Research on early intervention for young children with ASD is increasingly focused on identifying delivery formats that are both effective and sustainable. The G-ESDM program described in this chapter is consistent with this growing effort. While initial data on feasibility and effectiveness are promising, there remain several questions to be addressed, including the community viability of this model, particularly in areas serving low income families, as well as the durability of activities and resources after initial

funding and training. Additionally, there is little knowledge on the long-term impact of delivering the G-ESDM on child outcomes (31), staff fidelity, and the impact on organizational culture of early childhood education settings. While the G-ESDM requires the combined use of multiple evidence-based strategies, adaptations (including dropping some of these strategies) may be necessary for the G-ESDM to meet the needs of providers and families across different cultures (including variations on how early childhood education services are organized and culture-specific beliefs on early education and the role of educators).

As the "active ingredients" of intervention or training that are most relevant to producing benefits for children receiving the G-ESDM are still to be identified, it remains unclear which components of the "package" can be excluded or modified without diluting effectiveness. Additionally, as most early childhood education and care settings do not include a transdisciplinary team with allied health staff, research is needed on the amount and format of training and specialist supervision that is necessary to make interventions implemented by early childhood educators as effective as clinician-delivered programs. A research program informed by these questions has the potential to promote the widespread adoption of group-based intervention programs for children with ASD within early childhood community settings and facilitate sustainment after initial funding. This, in turn, holds the potential to mitigate the disability associated with ASD and maximize social participation and wellbeing for both children and their families.

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Footnote

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