CASEmakers
Sources of Information About Early Childhood & Family Support Practices

Sources of Information on Dosage in Early Intervention

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Abstract

The dosage of early intervention services impacts both child and family progress toward outcomes, but is poorly defined in the literature. A gap also exists between appropriate dosage, which is the dosage recommended based on child and family factors, and delivered dosage, which is the support actually provided to children and families after accounting for program and scheduling factors. This *CASE*maker bibliography includes selected references that describe the common ways dosage is referred to in the literature and provides information about appropriate dosage, the dosage gap, and the impacts of this gap on child and family outcomes.

Introduction

The field of early childhood intervention (EI) does not have a universal definition of dosage. Because EI services take place in natural environments, including homes, schools, and community settings, and emphasizes caregiver action between direct support visits, dosage can be difficult to quantify (Guralnick, 2011; Hallam et al., 2009; Wallace & Rogers, 2010). Generally, dosage includes the amount of direct service provided to a family, calculated by determining both the number of visits and the length of each visit conducted by all early intervention providers supporting the family (Hallam et al., 2009). Important to note is the dosage delivered to a family is different than dosage of practice that a child receives. Dosage delivered to a family, which is the dosage most often reported by EI programs, is measured by the number of visits in which an interventionist provides capacity-building supports to a child's caregiver (Guralnick, 2011; Hallam et al., 2009). The dosage of practice that a child receives in learning a novel skill or strategy, however, is entirely different than the dosage of support a caregiver receives in teaching that skill. Practice dosage is typically referenced in provider interactions, but dosages of practice opportunities are not limited to provider interactions when a caregiver is competent in providing high-quality practice during daily routines and activities. The dosage of interventions that a child receives should, in nearly every case, be much higher because the child receives intervention both during visits with the EI provider and between visits with the caregiver (Kuhn & Marvin, 2016). When caregivers are supported with a frequency that makes them more confident and competent, they deliver a higher amount of practice opportunities to children on a daily basis (Block et al., 2014; Hallam et al., 2009; McManus et al., 2020).

The understanding of who receives doses of EI and under what circumstances is crucial to understanding the difference between an appropriate and delivered dosage. The individualized family service plan (IFSP) is a document that details the amount of support a family receives from their EI provider, typically measured in weekly, monthly, or quarterly frequencies of visits and average length of visits. Even once an appropriate dosage has been determined, problems may still arise. For various reasons, the dosage deemed appropriate may not actually be delivered to the child and family. In some cases, programs may be limited in time and resources to permit a provider to support a family with the frequency they feel would be the most appropriate (Block et al., 2014; McManus et al., 2020). This can be due to a shortage of providers, difficulty managing driving time, or even concerns related to billing. In other cases, dosage may be limited by family availability. Some families frequently cancel visits or decline to schedule for a variety of reasons, while other families are limited

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in the time available for visits by a child's behavioral or medical conditions (Block et al., 2014; McManus et al., 2019). These complicating factors lead to a gap between the dosage deemed appropriate for the child and family and the dosage that is actually delivered. This *CASE*maker will explore the factors that impact both the determination of appropriate dosage and the efficient delivery of dosage.

Child Factors

Specific characteristics of children receiving EI impact the appropriate dosage. Children with complex diagnoses such as cerebral palsy, autism spectrum disorders, Down syndrome, and similar diagnoses have been shown to benefit from increased doses of support in EI (Hadders-Algra, 2014; McManus et al., 2020; Wallace & Rogers, 2010). Providers are more likely to recommend high levels of dosage for children who have a greater severity of impairment associated with their diagnosis. Children who are older when they enter EI are also more likely to receive a higher dose, possibly due to a perceived need to provide support before the child transitions into school services (Block et al., 2014; Hallam et al., 2009; McManus et al., 2020). The following articles describe the impact of child factors on EI dosage.

Hallam, R. A., Rous, B., Grove, J., & LoBianco, T. (2009). Level and intensity of early intervention services for infants and toddlers with disabilities. *Journal of Early Intervention*, *31*(2), 179-196. https://doi.org/10.1177/1053815109331914

Mahoney, G., Robinson, C., & Perales, F. (2004). Early motor intervention. *Infants & Young Children*, *17*(4), 291-300. https://doi.org/10.1097/00001163-200410000-00003

Rx Prescription for Practice Rx

The prescription for practice lists references that describe the common ways dosage is referred to in the literature and provides information about appropriate dosage, the dosage gap, and the impacts of this gap on child and family outcomes:

Kuhn, M., & Marvin, C. A. (2016). "Dosage" decisions for early intervention services. *Young Exceptional Children*, *19*(4), 20-34. https://doi.org/10.1177/1096250615576807

McManus, B. M., Richardson, Z., Schenkman, M., Murphy, N. J., Everhart, R. M., Hambidge, S., & Morrato, E. (2020). Child characteristics and early intervention referral and receipt of services: A retrospective cohort study. *BMC Pediatrics*, *20*, Article 84. https://doi.org/10.1186/s12887-020-1965-x

Family Factors

Factors and characteristics of caregivers and families receiving EI supports also impact both the appropriate and delivered dosage of services. Family factors such as low socioeconomic level, low levels of education, and other stressors have been identified in the literature as factors that increase the likelihood of a gap between appropriate and delivered dosage (Block et al., 2014; Brody et al., 2006; Guralnick, 2011; Hallam et al., 2009). Furthermore, research indicates that the responsive relationship and interactions between caregivers and children can provide a similar or greater amount of intervention hours provided than services provided directly to the child by the interventionist (Kuhn & Marvin, 2016; Mahoney et al., 2004; Palisano et al., 2012). For this reason, the existing relationship between the child and the caregiver as well as the caregiver's comfort level in using responsive strategies may be a key factor in determining the level of support that a family needs. The following articles elaborate on family factors that impact dosage decisions in EI.

Block, S. R., Rosenberg, S. A., Kellar-Guenther, Y., Robinson, C. C., & Goetze, L. (2014). Child and parent characteristics affecting the authorization and expenditure of funds for early intervention services. *Journal of Disability Policy Studies*, *26*(1), 3-11. https://doi.org/10.1177/1044207313518070

Brody, G. H., Murry, V. M., Chen, Y., Kogan, S. M., & Brown, A. C. (2006). Effects of family risk factors on dosage and efficacy of a family-centered preventive intervention for rural African Americans. *Prevention Science*, *7*(3), 281-291. https://doi.org/10.1007/s11121-006-0032-7

Dosage Gap

The appropriate and delivered dosage often differ, sometimes significantly (Perry et al., 2001). Generally, children receive a dosage of EI that is less than what providers would recommend or prefer (Hadders-Algra, 2014; McManus et al., 2019). Differences in delivered dosage may be due to family factors such as missed visits, child factors such as age at program entry or frequent hospitalization, and practitioner factors such as availability (Block et al., 2014; McManus et al., 2020; Nygren et al., 2018). Families with poor "adherence," which is to say

families who frequently miss scheduled visits, may have a larger difference between the appropriate dosage and the delivered dosage and demonstrate decreased progress toward outcomes (Block et al., 2014; McManus et al., 2019). In other circumstances, providers are unable to support families with the dosage they would prefer in ideal circumstances. Certain providers may have full schedules due to decreased availability (Nygren et al., 2018). Other times, dosage may be limited by practitioner drive time or decreased program resources. The following sources are helpful in understanding why not all children and families receive an optimal dosage of EI.

McManus, B. M., Richardson, Z., Schenkman, M., Murphy, N., & Morrato, E. H. (2019). Timing and intensity of early intervention service use and outcomes among a safety-net population of children. *JAMA Network Open*, *2*(1), Article e187529. https://doi.org/10.1001/jamanetworkopen.2018.7529

Perry, D. F., Greer, M., Goldhammer, K., & Mackey-Andrews, S. D. (2001). Fulfilling the promise of early intervention: Rates of delivered IFSP services. *Journal of Early Intervention*, *24*(2), 90-102. https://doi.org/10.1177/105381510102400202

Woodman, A. C., Demers, L., Crossman, M. K., Warfield, M. E., & Hauser-Cram, P. (2018). Part C early intervention dosage and growth in adaptive skills from early childhood through adolescence. *Early Childhood Research Quarterly*, *43*, 73-82. https://doi.org/10.1016/j.ecresq.2018.01.007

Impact of Program Factors on the Dosage Gap

The service delivery and teaming models used to provide services to a child and family also impact both the appropriate dosage and the delivered dosage (Hallam et al., 2009). Children whose EI providers use a coaching interaction style with a focus on between-visit planning receive support from caregivers as part of their daily activities rather than only during EI visits (Guralnick, 2011; Hadders-Algra, 2014; Woodman et al., 2018). Well-executed early intervention includes a specific plan for caregivers to implement strategies with children on a regular basis between EI visits. When caregivers have a high capacity to implement these strategies, the practice dosage increases substantially as strategies are implemented throughout daily routines and activities. This increase in meaningful practice between EI visits may decrease the frequency of visits needed to help families achieve outcomes as children are receiving supports on a daily basis from caregivers in natural environments (Guralnick, 2011; Hallam et al., 2009).

Guralnick, M. J. (2011). Why early intervention works. *Infants & Young Children*, *24*(1), 6-28. https://doi.org/10.1097/iyc.0b013e3182002cfe

Wallander, J. L., Biasini, F. J., Thorsten, V., Dhaded, S. M., De Jong, D. M., Chomba, E., Pasha, O., Goudar, S., Wallace, D., Chakraborty, H., Wright, L. L., McClure, E., & Carlo, W. A. (2014). Dose of early intervention treatment during children's first 36 months of life is associated with developmental outcomes: An observational cohort study in three low/low-middle income countries. *BMC Pediatrics*, *14*, Article 281. https://doi.org/10.1186/1471-2431-14-281

Impact of Dosage

Although the literature does not establish a single appropriate dosage or dosage formula, it does establish that children and families who receive more hours of service often show improved progress toward child and family outcomes (Hadders-Algra, 2014; McManus et al., 2020; Nygren et al., 2018; Perry et al., 2001; Wallander et al., 2014). These data indicate that children and families may benefit from a higher level of dosage than they actually receive in most EI programs. While underdosing is a real concern, teams must also be careful to consider the impact of EI dosage on family quality of life. In some cases, very high levels of dosage could become overwhelming for families (McManus et al., 2019; Nygren et al., 2018) and higher levels of dosage may not be utilized even by families who would typically be identified as benefitting from higher levels of dosage. The following sources discuss impacts of changes in dosage on child and family progress toward functional outcomes.

Block, S. R., Rosenberg, S. A., Kellar-Guenther, Y., Robinson, C. C., & Goetze, L. (2014). Child and parent characteristics affecting the authorization and expenditure of funds for early intervention services. *Journal of Disability Policy Studies*, *26*(1), 3-11. https://doi.org/10.1177/1044207313518070

Nygren, P., Green, B., Winters, K., & Rockhill, A. (2018). What's happening during home visits? Exploring the relationship of home visiting content and dosage to parenting outcomes. *Maternal and Child Health Journal*, *22*(S1), 52-61. https://doi.org/10.1007/s10995-018-2547-5

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Conclusion

There is no universal definition or theory of dosage in early intervention. A variety of factors related to children, families, and services may impact the dosage children and families need to reach outcomes in a timely manner. Families often receive less service than assigned in their IFSP due to family, practitioner, and program factors. Finally, children who receive high levels of practice and family support tailored to caregiver needs show increased participation in family routines and an overall increased caregiver satisfaction with EI as a whole.

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