

Challenges of the diversity of associations between self-regulation and socioeconomic deprivation during childhood and adolescence

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Executive Summary

- Self-regulation is a construct that refers to different emotional and cognitive processes that help people adapt to changes that occur in their everyday lives.
- Systemic conceptions of self-regulation development propose that their intra- and inter-individual changes are supported by complex dynamics involving different levels of organization (i.e., molecular, cellular, neural networks, cognitive, behavioral, social, and cultural), that result in different individual trajectories.
- The construction and use of knowledge about self-regulatory development based on partial information, of only some aspects or levels of organization, raises the problem of making invisible characteristics, opportunities, and needs of groups of children and adolescents with specific needs to promote their development.
- The conceptual proposals and methodological developments of the complex perspectives of self-regulation development contribute to innovation in the design, implementation, and evaluation of interventions and policies aimed at its promotion for children and adolescents exposed to socioeconomic deprivations.

Introduction

Self-regulation is a psychological construct that refers to different emotional and cognitive processes that help people adapt to the changes that occur in their development, study, work, and recreation contexts. These processes include attention, inhibitory control, working memory, cognitive flexibility, self-monitoring, and planning. In particular, these processes are of vital importance for the acquisition and use of learning from the early stages of development.

Specifically, self-regulation development is a complex process that involves changes and interdependencies between biological, psychological, social, cultural, and historical factors throughout life (Lerner, 2018). For example, the possibility of monitoring their behavior during the resolution of academic tasks during childhood is associated both with the progressive integration of neural networks associated with cognitive control, and with parenting and stimulation for learning at home, the susceptibility of children to pedagogical contexts, the quality of the bond with peers and teachers, school resources and educational policies. This implies the need to describe and explain individual and intra-individual changes in events that are expressed at different levels of organization.

A concept that derives from this perspective is the *principle of specificity* developed by Bornstein (2017), which proposes that the contextual conditions of specific people, occurring at specific times in their lives, modulate specific domains of their development. This means that: (1) there would not be a single trajectory of development in general, (2) such trajectories would not be universal, and (3) experiences should not be expected to have identical impacts on all individuals (Cantor et al., 2019).

The accumulated evidence of self-regulatory development also suggests that it can be influenced by different aspects related to the health, care, and education of children by different social actors who play their roles in different contexts (e.g., home, school, society, culture), and at specific historical moments (López-Pérez & Pacella, 2021). Emotional and cognitive self-regulation is considered by developmental sciences as an important aspect of people's adaptive behavior in the face of the demands of their social and physical environments throughout the life cycle (Bailey & Jones, 2019). On the one hand, the evidence suggests that more specific knowledge is required on what its specific components are, what type of information is relevant for adaptations that require making decisions, acting and evaluating the consequences of actions, the role of emotions in such processes, and the conceptualization of adaptation implied in the construct (e.g., Doebel, 2020; Wu et al., 2021). On the other hand, there is a scientific consensus about the early emergence of self-regulatory processes, and the variability of their development trajectories according to individual differences at different levels of organization, and inter-individual differences according to the quality of proximal development contexts, such as home and school (McClelland et al., 2015; Obradovic et al., 2010; Scruggs & Mastropieri, 2013).

Associations between socioeconomic deprivation and self-regulatory development

Specifically, the available evidence indicates that at the individual level, socioeconomic deprivation is associated with self-

regulatory development at the neural, cognitive, and behavioral levels (e.g., Johnson et al., 2016; Noble & Giebler, 2020). A synthesis of this evidence suggests that between childhood and adolescence this type of deprivation is associated with: (a) increased wear and tear of different physiological systems (e.g., immunological, metabolic, cardiovascular, stress response)^[1]; (b) lower cortical thicknesses and volumes, slower growth and thinning over time in cortical and subcortical networks; (c) lower related executive function, language and learning performances; (d) differential neural activation in tasks demanding speech, phonological, cognitive control, threat, arithmetic, and learning processing; and (e) diverse associations between different risk constellations and cognitive control ^[2](Ben-Asher et al., 2024; Farah, 2017; Jensen et al., 2017; Mayo et al., 2022; Misiak et al., 2022; Mooney et al., 2021; Noble et al., 2020; Rakesh et al., 2023). It is still under debate whether exposure to socioeconomic deprivation generates an acceleration of neural development associated with self-regulation, a deceleration, or whether it is merely inter-individual differences (Rakesh et al., 2023; Tooley et al., 2021).

These studies have also identified a set of factors that modulate self-regulatory development in contexts of socioeconomic deprivation^[3] that partially can explain such diversities. These include peri- and postnatal health history; food security; temperamental characteristics; maternal education and health; family composition; caregiver's mental health; negative life events; opportunities to promote learning at home; home structural quality; and the cultural available social role models (Bradley, 2015; Johnson et al., 2016; Long & Renbarger, 2023).

Likewise, in the last two decades different psychological and neuroscientific studies focused on promoting changes in different self-regulatory processes (e.g., attention, working memory, inhibitory control), through the implementation of experimental interventions with populations of children and adolescents exposed to socioeconomic deprivation. In general, the evidence suggests that it is possible to modify both self-regulatory performance and neural resources in child populations from poverty contexts during the first two decades of life (e.g., Canet Juric et al., 2020; Company-Córdoba et al., 2021; Giovannetti et al., 2021; Johnson et al., 2019; Karbach & Kray, 2016; Lurie et al., 2024; Pietto et al., 2021).

However, low to moderate effect sizes and differences in the impacts of the interventions were identified according to type of activities, level of organization, and individual and contextual differences. In addition, the benefits related to interventions are usually verified in performance on tasks that are like those involved in the intervention (near transfer: when after attention training improvements are verified in other tasks with the same demand), and only in some cases are far transfer effects also verified (for example, when improvements in academic performance in mathematics are verified after attention training) (e.g., Au et al. al., 2015; Kassai et al., 2019). This means that different children would benefit more from one type of intervention than another based on their distinct opportunities and needs.

In summary, this body of evidence collected at different historical moments in different countries indicates that the probability of evidencing effects on self-regulatory development due to socioeconomic deprivation can be modulated by the exposure to the accumulation of different risk factors, the moment of development in which exposures occur, their duration and the susceptibility of each child to them (Bradley, 2015; Obradovic et al., 2010; Sheridan & McLaughlin, 2014). Consequently, according to the combination of type, quantity and duration of deprivations, there would be different subgroups of children with different impacts, opportunities, and needs.

Conclusions and suggestions for future actions

Advances in this area generate specific conceptual and methodological challenges, which necessarily require careful attention to both the construction and applications of this knowledge. The main issues that require reconsideration and the incorporation of broader approaches such as systemic-relational ones are: (1) Contribute to the visibility of the individual and contextual differences that characterize the variation of trajectories of self-regulatory development. (2) Explore the interdependencies of effects of socioeconomic deprivations at different levels of organization, to (a) identify specific needs for different groups of children; and (b) design and test specific interventions based on such criteria. (3) Advance in the identification of opportune development moments for the implementation of different interventions. (4) Implement longitudinal designs, considering different ecological (e.g., reports from parents and/or teachers; laboratory tasks; observations in everyday situations), and analytical approaches that consider the complexity of these phenomena. In this sense, the proposals to create global consortia for evaluating self-regulatory development become valuable.

In summary, the relationships between the development of self-regulation and how it is affected by socioeconomic deprivation must be studied considering how different factors interact with each other over time. For example, if to establish the association between self-regulatory development and socioeconomic deprivation only the indicator of family income and performance in an attentional task at the end of first grade is taken into account, the knowledge to be generated will be

reduced and not very generalizable because it does not consider other self-regulatory processes, individual and contextual differences, nor the variations over time of all these interdependent phenomena. Consequently, the use of this knowledge will also convey such limitations and will contribute to making groups of children invisible with other types of associations between self-regulation and socioeconomic deprivation, and therefore with different needs to be addressed through interventions. Specifically, the consideration of systemic perspectives of the associations between self-regulatory development and socioeconomic deprivation during childhood and adolescence is a task that requires interdisciplinary efforts, and that could contribute to the debate about the assumptions and conceptions of development, as well as to the design, implementation and evaluation of interventions and policies aimed at eliminating or reducing inequalities (Scheidecker et al., 2023). Finally, it would also be important to promote actions that encourage debate about the possibilities and limitations of different perspectives (e.g., universal vs. particular), as well as including the voices of those about whom processes and evolutions are assumed (e.g., children, adolescents and adults involved in any socialization practice).

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[1] This increase in the wear and tear of different physiological systems is known as *allostatic load*. The increase in this burden over the years is associated with an increase in diseases and a shortening of life expectancy.

[2] Socioeconomic deprivation can affect different aspects of child development such as nutrition, household resources to stimulate early learning, quality of care at home and school, mental health of caregivers, home infrastructure, the school and the community to promote child development, the norms, values and customs of a society related to people exposed to poverty. This constellation of factors is not identical for all people, so some of them may be exposed to deprivation of one set of these factors, while others to a different set. And each different type of constellation is differently associated with self-regulatory performance.

[3] See Brief "*Specificity of the associations between socioeconomic deprivation factors and neurocognitive development*".