Inline Skating as a physical education intervention in Primary Schools

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Research in education and movement sciences increasingly regards movement as a cognitive medium for cognitive development rather than mere bodily exercise: structured motor activities constitute privileged contexts for the development of executive functions (EFs), the top-down control processes underpinning self-regulation and learning (Diamond, 2013; Miyake et al., 2000). Evidence indicates that physical activity is associated with improvements in attention and EFs during the school years, with the most marked benefits when the task is cognitively demanding (Best, 2010; Barenberg et al., 2011): it is the complexity of the task, the demand to coordinate perception, decision and action under changing conditions, that engages inhibitory control, working memory and cognitive flexibility. Primary school represents a critical phase for intervention, since EFs pass through a sensitive developmental window in this period (Best & Miller, 2010).

Among complex motor activities, inline skating offers a particularly promising educational profile: an unstable, gliding base of support requires continuous postural regulation; pushing, gliding, turning and braking form motor chains demanding sequential planning; obstacles and route variations test cognitive flexibility, while loss of balance provides an immediate error threshold prompting monitoring and correction. Its predictable sequences and repeatable routines also make it highly supportive for pupils with special educational needs (SEN), including autism spectrum disorder (ASD) (Cottini, 2017). Within the biopsychosocial perspective of the ICF-CY (WHO, 2007), the study reads participation as the interaction between personal conditions and contextual factors: in a Calabrian territory marked by educational poverty, where school is for many the only access to structured motor experiences, the intentional design of the learning environment (Castoldi, 2020) becomes the enabling condition of the intervention and takes on an equity function (Booth & Ainscow, 2014).

Method

The study adopts a qualitative exploratory design with descriptive quantification of observations, deliberately advancing no causal claims. Between October 2024 and May 2025, an inline skating programme was delivered during curricular physical education hours (48 sixty-minute sessions) at a comprehensive school in Calabria, involving the entire population of twelve fourth- and fifth-grade classes: 184 pupils, including 14 with SEN, two with ASD. The didactic progression moved from familiarisation and static balance to dynamic balance and propulsion, then to changes of direction and braking, and finally to articulated sequences and cooperative circuits, within a setting organised by three constant criteria: predictability and safety, cognitive accessibility, stimulation of autonomy and interaction.

Data were collected through three complementary sources: purpose-built observation grids of 15 indicators anchored to ICF-CY codes, organised into five areas and mapped onto the three target EFs, completed in two four-session windows (PRE, October; POST, May) on a 0-4 ordinal scale; a staged educational diary compiled at three points and analysed through reflexive thematic analysis (Braun & Clarke, 2006); and PRE/POST context sheets documenting the transformations of the setting. Integration occurred through a convergence matrix classifying evidence as convergent,

complementary or dissonant; the quality criterion is credibility rather than internal validity (Lincoln & Guba, 1985).

Results

The diary yielded three cross-cutting themes: from impulse to shared rule (inhibitory control acquired through mediators such as the sound stop signal and the fixed starting ritual); flexibility as a frontier, the demand the group found hardest to consolidate; and an emotional arc from dispersive euphoria to competent satisfaction. Descriptively, the mean profile across the fifteen indicators rose from 1.32 to 2.56; observations at levels 0-1 fell from 58.7% to 16.8% of the 2,760 pupil-indicator pairs, while levels 3-4 rose from 11.9% to 53.4%. By target function, inhibitory control showed the largest mean change (+1.30), followed by working memory (+1.23) and cognitive flexibility (+1.13), the latter remaining at levels 0-1 for 62 pupils. Change was homogeneous across grades and genders; pupils with SEN started lower (0.90 vs 1.36) but improved comparably (+1.19 vs +1.24). The most probative convergence is a negative one: grids, diary and context sheets independently identified flexibility, planning and self-monitoring as the critical area, whose dedicated device, transitions between zones, was introduced only late in the cycle.

Discussion and conclusions

The differential profile of change reproduces the developmental order described in the literature, with inhibitory control maturing earlier and shifting consolidating later (Best & Miller, 2010; Diamond, 2013): the fragility of flexibility is not an anomaly of the intervention but the point where task demand meets the developmentally latest component. The covariation between transformations of the setting and of behaviours, documented in parallel by context sheets and grids, constitutes the interpretive core: zones of graduated difficulty, visual signage and stable routines operated as didactic mediators transforming barriers into facilitators. The comparable progress of pupils with SEN suggests the facilitators worked for the whole group, the expected profile when environmental conditions of participation change. The study delivers no proof of effectiveness but a repertoire of inclusive design conditions and working hypotheses, to be verified in a planned quasi-experimental study using standardised measures (BIA-R battery; Tower of London).

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References:

Barenberg, J., Berse, T., & Dutke, S. (2011). Executive functions in learning processes: Do they benefit from physical activity? Educational Research Review, 6(3), 208–222. https://doi.org/10.1016/j.edurev.2011.04.002

Best, J. R. (2010). Effects of physical activity on children's executive function: Contributions of experimental research on aerobic exercise. Developmental Review, 30(4), 331–351. https://doi.org/10.1016/j.dr.2010.08.001

Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. Child Development, 81(6), 1641–1660. https://doi.org/10.1111/j.1467-8624.2010.01499.x

Booth, T., & Ainscow, M. (2014). Nuovo Index per l'inclusione. Percorsi di apprendimento e partecipazione a scuola (F. Dovigo, Ed.). Carocci.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Castoldi, M. (2020). Gli ambienti di apprendimento. Ripensare il modello organizzativo della scuola. Carocci.

Cottini, L. (2017). Didattica speciale e inclusione scolastica. Carocci.

Diamond, A. (2013). Executive functions. Annual Review of Psychology, 64(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Sage.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. Cognitive Psychology, 41(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

World Health Organization (WHO). (2007). International Classification of Functioning, Disability and Health – Children and Youth Version (ICF-CY). WHO.