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Posted Date: 30 March 2026

doi: 10.20944/preprints202603.2343.v1

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Article

Adapted Sport and Physical Self-Concept in Youth with Motor Disabilities: A Longitudinal Comparative Study of Sport-Specific Developmental Trajectories

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Abstract

The present study aimed to investigate the effects of structured adapted sport participation on physical self-concept in youth with motor disabilities, examining sport-specific developmental trajectories and the mediating role of self-determined motivation. A longitudinal design with three measurement waves (T0, T1, T2) over 12 months was used. The participants were 223 individuals aged between 13 and 28, distributed across five groups: wheelchair basketball (n = 46), Paralympic swimming (n = 44), para-athletics (n = 45), adapted martial arts (n = 43), and a non-sporting control group (n = 45). Physical self-concept was assessed with the Physical Self-Description Questionnaire–Short (PSDQ-S) and motivation was measured with the Behavioural Regulation in Exercise Questionnaire–3 (BREQ-3). Mixed ANOVAs (5 × 3) showed significant main effects of sport type and time, as well as significant Sport × Time interactions across all 11 PSDQ-S subscales (all ps ≤ .01), with between-group effect sizes ranging from $\eta^2p = .13$ to $\eta^2p = .29$. Sport groups showed longitudinal gains of +0.3 to +0.7 points on the PSDQ-S from T0 to T2, while the control group remained stable. Each sport produced a different self-concept profile that was consistent with its specific physical demands: swimming (flexibility, aerobic endurance), wheelchair basketball (strength, coordination), para-athletics (physical activity, endurance), and martial arts (a more balanced profile). Mediation analysis showed that self-determined motivation partially mediated the relationship between sport and physical self-concept (b = 0.31, 95% CI [0.17, 0.48]), accounting for 52% of the total effect. Cluster analysis found three profiles: high integrated, specialized, and developing physical self-concept. The results of the study extend Scarpa's (2011) cross-sectional work by providing longitudinal evidence for the role of adapted sport in shaping physical self-concept, with implications for sport orientation and autonomy-supportive coaching in disability sport contexts.

Keywords: adapted sport; physical self-concept; motor disability; self-determination theory; longitudinal study; Paralympic sport; PSDQ-S

Introduction

The body is a central element of personal identity and has been studied across philosophical, clinical, and psychological traditions for more than a century (James, 1890). In the phenomenological tradition, Merleau-Ponty (1945) described how the lived experience of the body cannot be reduced to its organic or mechanical dimension: the body is at the same time an instrument of perception and an object of self-perception, and this makes the concept of the physical self both important and difficult to measure in empirical research. In this context, the relationship between the philosophical richness of the construct and the need to measure it through valid and reliable instruments has been one of the most important problems that sport and exercise psychology has tried to address. It is not a simple problem, and it has not yet been fully resolved.

In scientific psychology, the idea of physical self-concept, which is also called physical self-perception in some parts of the international literature, became progressively more important from the 1980s onward, when researchers including Herbert Marsh, Kenneth Fox, and Charles Corbin

began to develop theoretical models to account for the multidimensional structure through which individuals perceive themselves in physical terms (Fox & Corbin, 1989; Marsh et al., 1994). Before that period, self-concept psychology tended to treat self-perception as a single global construct, and this approach was influenced largely by the early work of William James (1890), who had already noted that the material self includes the body and its capacities. Only with the development of multidimensional models did it become possible to distinguish among the different aspects of physical self-perception, including strength, endurance, flexibility, coordination, physical activity, body fat, physical appearance, sport competence, and global physical self-worth, and to study how these aspects relate differently to behavioral and contextual variables.

For individuals with motor disabilities, the relationship between the body and self-concept is particularly complex and important. Physical limitations can substantially reduce the range of bodily experiences available for constructing positive physical self-perceptions, and societal attitudes toward disability, the experience of bodily difference in social situations, and the internalization of stigma may further shape the way a person evaluates his or her own body (Matelionytė, 2026). In this context, the body that Western culture tends to value, which is typically strong, agile, and aesthetically normative, is systematically different from the body experienced by a person with motor disability, and this creates conditions in which standard physical self-concept instruments may not fully capture what is most important for this population. However, a growing number of studies have shown that structured sport participation can contribute to developing a positive physical self-concept in persons with motor disabilities (Isidoro-Cabañas et al., 2023; Puce et al., 2023; Said & Alhumaid, 2023). The specific mechanism through which sport produces this effect, however, is not yet well understood, especially regarding the different contributions of specific sport disciplines and the psychological processes that explain change over time.

Scarpa (2011) and the Cross-Sectional Baseline

The study by Scarpa (2011), published in the *European Journal of Adapted Physical Activity*, made an important contribution to this field by showing, for the first time in an Italian population with physical disabilities, that regular sport participation was associated with significantly higher scores in global self-esteem and physical self-concept, measured with the Physical Self-Description Questionnaire (PSDQ), compared to inactive peers with similar disability profiles. Scarpa's merit was to apply the multidimensional hierarchical model of physical self-concept, which had been mainly used in populations without disabilities, to a population of adolescents and young adults with motor impairments. The results highlighted that the model's multidimensional structure was maintained and meaningful in this specific population. In this respect, the study showed that persons with physical disability who practise sport obtained similar results to the people without disability who also practised sport on several PSDQ subscales.

However, the data in Scarpa (2011) were collected at a single time point, which made it impossible to draw any causal conclusions and left open the fundamental question of temporal ordering. Specifically, it was not clear whether sport improves physical self-concept, or whether individuals who already have more positive self-perceptions are simply more likely, perhaps due to personality characteristics, family support, or lesser disability severity, to start and maintain structured sport participation. This self-selection problem, which Scarpa himself acknowledged, is the most serious limitation of the cross-sectional literature and is the primary gap that the present study was designed to address. In addition, Scarpa's study treated sport participation as a binary variable (active vs. inactive) without distinguishing among specific disciplines, and this approach did not allow the possibility that different sports produce different patterns of physical self-concept development to be examined.

Gaps in the Literature

Three important gaps in the existing research motivated the present study. First, most studies in adapted sport psychology have used cross-sectional designs, and this makes it very difficult to identify developmental trajectories or to make causal claims. Longitudinal studies in this field are still scarce, despite repeated calls for temporal designs that can distinguish within-person change from between-person differences (Schluchter et al., 2023). Among the few longitudinal studies available, most have used short observation periods, small samples, or have focused on a single sport discipline, and these limitations reduce the scope of their conclusions. The absence of multi-sport longitudinal comparisons is a significant methodological gap that limits both theoretical progress and practical application.

Second, no study to date has systematically compared the effects of multiple adapted sport disciplines on multidimensional physical self-concept within the same design, using the same instruments and the same analytical approach. The existing literature treats adapted sport as a single category, and this simplification hides the possibility that different disciplines, with their distinct physical demands, training settings, social structures, and competitive formats, may produce qualitatively different patterns of physical self-concept development. In this context, the physical demands of wheelchair basketball, which requires explosive upper-body power and dynamic postural control, are very different from those of Paralympic swimming, which requires cardiorespiratory endurance and joint flexibility in a water environment. These different motor characteristics should logically produce different patterns of perceived physical competence, but this hypothesis has not been tested in a comparative longitudinal framework.

Third, the motivational mechanisms that explain the relationship between sport and physical self-concept in populations with motor disabilities have not been empirically tested, even though there are well-established theoretical frameworks that could guide such research. The question of why sport participation is associated with more positive physical self-concept, beyond the simple observation that it is, remains largely unanswered in the adapted sport literature. In this respect, understanding the mediating mechanisms is not only important from a theoretical point of view; it also has direct practical implications for designing interventions that increase the psychological benefits of sport participation.

Self-Determination Theory as a Theoretical Framework

The Self-Determination Theory (SDT; Deci & Ryan, 1985) provides the motivational framework for the present study. SDT proposes that human motivation lies along a continuum from amotivation through different forms of extrinsic regulation (external, introjected, identified, integrated) to intrinsic motivation. More self-determined forms of motivation, which are driven by identification, integration, and intrinsic interest, are associated with greater persistence in the activity, deeper engagement, and more positive psychological outcomes, including subjective well-being, perceived competence, and the development of a positive activity-related identity (Sarol, 2024). The satisfaction of three basic psychological needs, specifically competence, autonomy, and relatedness, within sport contexts is thought to promote the progressive internalization of motivation and, through this process, the development of positive physical self-perceptions.

In this context, SDT offers a particularly useful explanatory framework for adapted sport. It has been recognized that the structured features of adapted sport, including training routines, the relationship with teammates and the coach, competition, and measurable technical progress, may create conditions that support the development of more internalized forms of motivation and reduce dependence on external and introjected regulators (Ben Rakaa et al., 2025; Sarol, 2024). The theory predicts that self-determined motivation should partially mediate the relationship between sport participation and physical self-concept: sport participation promotes self-determined motivation, and self-determined motivation in turn promotes positive physical self-perceptions. This mediation hypothesis, namely that sport influences the physical self not only through physical exposure but

also through the quality of motivational engagement it supports, has not been previously tested in a sample of youth with motor disabilities engaged in specific sports.

Recent work by Matelionytė (2026) has further added to this theoretical framework by showing that disability identity, understood as a positive and integrated evaluation of oneself as a person with a disability, is significantly correlated with both athletic identity and different forms of motivational regulation in a way that is consistent with the SDT model. This finding suggests that there is a mutually reinforcing relationship among the different components of positive identity in persons with disabilities who practice sport, in which disability identity, athletic identity, and self-determined motivation support each other. In this direction, it seems possible to assert that these identity components work together to produce more stable and positive physical self-perceptions over time.

Objectives and Hypotheses

The present study was designed to extend Scarpa's (2011) cross-sectional findings through a longitudinal prospective design that addresses the three gaps described above. The general aim was to examine the effects of structured adapted sport participation on multidimensional physical self-concept in adolescents and young adults with motor disabilities, comparing sport-specific developmental trajectories over 12 months and studying the mediating role of self-determined motivation. In particular, four hypotheses were tested:

Hypothesis (a): Adolescents and young adults with motor disabilities engaged in structured sport would obtain significantly higher PSDQ-S scores than the non-sporting control group, replicating and extending Scarpa's (2011) cross-sectional pattern in a longitudinal framework.

Hypothesis (b): Different sport disciplines would produce different physical self-concept profiles, attributable to the distinct physical demands and motor competencies required by each sport.

Hypothesis (c): Self-determined motivation, measured through the SDT framework using the BREQ-3, would partially mediate the relationship between sport participation and physical self-concept.

Hypothesis (d): Sport groups would show significant longitudinal increases in physical self-concept from T0 to T2, while the control group would remain substantially stable.

Method

Research Design

The present study used a longitudinal prospective design with repeated measures, organized across three data collection waves (T0, T1, T2) distributed over 12 months at 6-month intervals. The design was mixed, with sport group membership as the between-subjects factor (five levels: wheelchair basketball, Paralympic swimming, para-athletics, adapted martial arts, and a non-sporting control) and time as the within-subjects factor (three levels: T0, T1, T2). A longitudinal design was chosen because understanding multidimensional physical self-concept requires a perspective that is capable of capturing individual and group trajectories of change over time, rather than being limited to the static picture offered by cross-sectional designs. The 6-month interval between waves was selected to allow sensitivity to change while also meeting the practical demands of data collection in a population distributed across multiple sport settings and geographic locations.

Participants

The final sample comprised $N = 223$ participants, aged 13–28 years, distributed across five groups: wheelchair basketball ($n = 46$), Paralympic swimming ($n = 44$), para-athletics ($n = 45$), adapted martial arts ($n = 43$), and a non-sporting control group ($n = 45$). The sample included 131 males (58.7%)

and 92 females (41.3%), with a mean age of $M = 19.8$ years ($SD = 4.2$). Disability types included peripheral paraplegia, spastic paraplegia, and cerebral paraplegia. An a priori power analysis (G*Power 3.1) targeting a medium effect size ($f = 0.25$), $\alpha = .05$, power = .80, for a 5×3 mixed ANOVA with five groups and three measurements indicated a minimum required sample of $N = 200$, which the final sample exceeded.

Inclusion and Exclusion Criteria

Inclusion criteria were: (a) age between 13 and 28 years; (b) documented motor disability (congenital or acquired) of peripheral or central origin; (c) for sport groups, regular participation in the specified discipline for a minimum of 6 months at enrollment with a training frequency of at least two sessions per week; (d) for the control group, no regular participation in any structured sport or adapted physical activity program. Exclusion criteria were: (a) intellectual disability with IQ below 70, as assessed by prior clinical evaluation; (b) progressive neurodegenerative conditions expected to substantially alter motor function during the study period; (c) concurrent participation in more than one structured sport at enrollment. These criteria were established so that observed effects could be attributed to participation in a specific discipline rather than to multiple concurrent sport experiences.

Recruitment

Sport group participants were recruited through the Italian Paralympic Swimming Federation (FINP), the Italian Federation of Paralympic Sports for Amputees and Multiple Sclerosis (FISPES), the Italian Paralympic Committee (CIP), and individual adapted sport associations in Northern Italy. The control group participants were recruited through rehabilitation centers and associations for persons with motor disabilities in the same geographic area, to ensure comparable sociodemographic and clinical backgrounds. Informed consent was obtained from all adult participants; for minors, parental consent and participant assent were obtained in accordance with institutional ethical requirements. Approval was first obtained from the institutional ethics committee, and the study was conducted in accordance with the Declaration of Helsinki.

Description of Sport Disciplines

The four sport disciplines were selected to represent a diversity of motor demands, competitive formats, and training environments within the Italian adapted sport system. Wheelchair basketball is a team sport requiring explosive upper-body propulsion, rapid directional changes, dynamic postural control, and tactical coordination. Paralympic swimming includes multiple strokes and distances in an aquatic environment that reduces gravitational load, amplifies proprioceptive feedback, and requires sustained cardiorespiratory capacity. Para-athletics includes a range of events, from wheelchair racing to throwing events, and is characterized by high training volumes and emphasis on physical conditioning. Adapted martial arts (including adapted judo, taekwondo, and karate) require simultaneous integration of flexibility, coordination, and force application within codified technical sequences, and also include a progressive grading system (belt levels) that provides structured mastery feedback. The non-sporting control group included individuals who did not engage in any regular structured physical activity beyond activities of daily living and physiotherapy.

Measures

Physical Self-Description Questionnaire–Short (PSDQ-S)

In the present study we used the PSDQ-S (Marsh et al., 1994) to assess multidimensional physical self-concept. The short form consists of 40 items rated on a 6-point Likert scale (1 = false to 6 = true), measuring 11 subscales: Physical Activity, Body Fat (Obesity), Physical Appearance, Coordination, Endurance, Flexibility, Health, Sport Competence, Strength, Global Physical Self-Concept, and

Global Self-Esteem. Higher scores indicate more positive self-perceptions. The PSDQ was developed within the framework of Marsh's hierarchical multidimensional model of physical self-concept, which posits that global physical self-concept is underpinned by distinct and empirically separable subdimensions that can be influenced in different ways by specific types of physical activity. The PSDQ-S has shown good psychometric properties across multiple populations and cultural contexts, including recent validation in adapted sport settings (Cai et al., 2025). Internal consistency in the present sample was adequate to excellent across subscales (Cronbach's α range: .78–.92 across subscales and time points).

Behavioural Regulation in Exercise Questionnaire–3 (BREQ-3)

The BREQ-3 was used to assess the motivational quality of sport engagement along the SDT continuum. The instrument measures six regulatory subscales: amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. A Relative Autonomy Index (RAI) was computed as a weighted composite indicator of self-determined motivation, with higher values indicating more autonomous motivational regulation. The RAI integrates the six subscales into a single continuum score by applying positive weights to more autonomous forms of regulation and negative weights to more controlled forms, providing a summary of overall motivational quality. The BREQ-3 has been validated in exercise and sport contexts with populations with physical disabilities (Sarol, 2024).

Sociodemographic and Sport Participation Questionnaire

A purpose-designed questionnaire was used to collect demographic data (age, sex, education level), disability-related information (type, origin, age at onset, duration), and sport participation variables (discipline, training frequency, competition level, years of sport experience, and perceived satisfaction with teammate relationships).

Procedure

Data were collected across three waves spaced 6 months apart (T0, T1, T2), for a total observation period of 12 months. At each wave, participants completed the PSDQ-S and BREQ-3 in individual or small-group sessions supervised by trained research assistants. Questionnaires were completed in paper-and-pencil format to ensure accessibility for participants with varying levels of motor impairment. For participants with severe upper-limb limitations, questions were read out loud and responses were transcribed by the research assistant, so that motor impairment did not constitute a barrier to participation. Administration sessions lasted approximately 30–40 minutes. Research assistants received standardized training covering administration protocols, rapport-building techniques, and sensitivity to disability-related concerns. Data quality was monitored through systematic checking for missing values, response patterns indicative of inattentive responding, and protocol deviations.

Data Analysis

Analyses proceeded in five stages. First, preliminary analyses included descriptive statistics, normality assessment (Shapiro-Wilk tests, skewness, kurtosis), and verification of ANOVA assumptions (Levene's test for homogeneity of variance, Mauchly's test for sphericity). Greenhouse-Geisser corrections were applied where sphericity was violated. Second, 5 (Sport Group) \times 3 (Time) mixed ANOVAs were conducted for each of the 11 PSDQ-S subscales, with sport group as the between-subjects factor and time as the within-subjects factor. Partial eta squared (η^2_p) was reported as the effect size measure, interpreted following Cohen's (1988) benchmarks: small $\geq .01$, medium $\geq .06$, large $\geq .14$.

Third, Bonferroni-corrected post-hoc pairwise comparisons examined between-group differences at T2 and longitudinal within-group changes. Fourth, mediation analysis was conducted

using the PROCESS macro version 4.2 (Model 4; Hayes, 2018) with 5,000 bootstrap resamples, testing self-determined motivation (RAI at T1) as a mediator of the sport–self-concept relationship (X = sport participation; Y = PSDQ-S composite at T2), controlling for baseline self-concept at T0. Moderated mediation (Model 14) examined whether sport experience moderated the mediation pathway. Fifth, hierarchical cluster analysis (Ward's method) followed by k-means clustering was performed on standardized PSDQ-S scores (averaged across time points) to identify latent physical self-concept profiles. The optimal cluster solution was determined using the elbow criterion in the dendrogram and the Calinski-Harabasz coefficient. All analyses were conducted using SPSS version 28 with the PROCESS macro. The significance threshold was set at $\alpha = .05$, with Bonferroni correction applied for multiple comparisons (adjusted $\alpha = .05/11 = .0045$ for the 11 PSDQ-S subscales).

Results

Sample Characteristics

Table 1 presents the demographic and sport-related characteristics of the sample by group. The five groups did not differ significantly in age, $F(4, 218) = 1.42$, $p = .228$, or in sex distribution, $\chi^2(4) = 3.87$, $p = .424$. Sport groups had a mean training frequency of 3.2 sessions per week ($SD = 0.8$) and a mean sport experience of 3.7 years ($SD = 2.1$). The distribution of disability types (peripheral, spastic, cerebral paraplegia) was comparable across groups. No significant differences emerged between groups in socioeconomic indicators or educational attainment.

Baseline Physical Self-Concept Profiles

Descriptive statistics for the PSDQ-S subscales at T0 are presented in Table 2. All four sport groups showed markedly higher scores than the control group across all 11 subscales at baseline. The baseline profiles already reflected the biomechanical and motor characteristics specific to each discipline. The wheelchair basketball group presented the highest scores in Strength ($M = 4.42$, $SD = 0.77$) and Coordination ($M = 4.38$, $SD = 0.78$), consistent with the demands of wheelchair propulsion, directional changes, and postural control in this sport. The Paralympic swimming group showed particularly high scores in Endurance ($M = 4.51$, $SD = 0.76$) and Flexibility ($M = 4.33$, $SD = 0.83$), which reflects the cardiorespiratory competencies and joint mobility required by aquatic training. The para-athletics group had the highest scores in Physical Activity ($M = 4.48$, $SD = 0.74$) and Endurance ($M = 4.44$, $SD = 0.81$). The adapted martial arts group showed a more balanced profile, with relatively high scores in Coordination ($M = 4.29$, $SD = 0.81$), Flexibility ($M = 4.31$, $SD = 0.82$), and Strength ($M = 4.19$, $SD = 0.78$). The control group showed lower scores on all subscales, with a particularly low profile for Physical Activity ($M = 3.02$, $SD = 0.81$), Sport Competence ($M = 2.91$, $SD = 0.88$), and Coordination ($M = 3.08$, $SD = 0.87$).

Longitudinal Trajectories

Table 3 displays the means and standard deviations for the principal PSDQ-S subscales across all three time points by group. The four sport groups showed progressive and systematic increases between T0 and T2, with changes varying between +0.30 and +0.42 points depending on the subscale and discipline, while the control group remained essentially stable, with mean variations below 0.05 points across all subscales and all time points.

In this context, it is worth noting the differences in change profiles between disciplines. The Paralympic swimming group showed the most pronounced increases in Endurance ($\Delta T0-T2 = +0.37$) and Flexibility ($\Delta T0-T2 = +0.40$). The wheelchair basketball group presented the most marked changes in Coordination ($\Delta T0-T2 = +0.36$) and Strength ($\Delta T0-T2 = +0.39$). The para-athletics group showed the largest increments in Endurance ($\Delta T0-T2 = +0.40$) and Coordination ($\Delta T0-T2 = +0.34$). The adapted martial arts group showed relatively balanced change profiles across Flexibility ($\Delta T0-T2 = +0.40$), Coordination ($\Delta T0-T2 = +0.40$), and Strength ($\Delta T0-T2 = +0.39$). These differentiated

profiles, already visible at the descriptive level, received statistical confirmation in the interaction analyses reported below.

Preliminary Analyses: Disability Type and Sex

Prior to the main analyses, exploratory analyses were conducted to verify whether disability type moderated baseline levels or longitudinal trajectories of physical self-concept. A one-way ANOVA on the PSDQ-S composite score at T0 by disability type showed significant differences, $F(2, 220) = 4.87$, $p = .008$, $\eta^2p = .04$, with cerebral paraplegia associated with slightly lower mean scores ($M = 3.72$, $SD = 0.82$) compared to peripheral paraplegia ($M = 4.01$, $SD = 0.74$) and spastic paraplegia ($M = 3.88$, $SD = 0.79$). However, the effect was small ($\eta^2p = .04$), and a subsequent 5 (Sport) $\times 3$ (Disability Type) $\times 3$ (Time) ANOVA yielded no significant three-way interactions for any of the principal subscales (all $ps > .12$), confirming that the sport-related changes in physical self-concept were found in a substantially similar manner regardless of the type of disability.

The examination of sex moderation showed that males presented slightly higher PSDQ-S composite scores at T0 than females ($M = 4.01$, $SD = 0.71$ vs. $M = 3.84$, $SD = 0.77$), although this difference did not reach statistical significance, $t(221) = 1.64$, $p = .102$. The most pronounced sex differences were found on Strength, $t(221) = 2.89$, $p = .004$, $d = 0.39$, and Sport Competence, $t(221) = 2.41$, $p = .017$, $d = 0.32$, while Flexibility and Health showed no significant sex differences. A 5 (Sport) $\times 2$ (Sex) $\times 3$ (Time) mixed ANOVA showed no significant three-way interactions for any subscale (all $ps > .09$), indicating that longitudinal changes in physical self-concept associated with sport participation were comparable in males and females (Isidoro-Cabañas et al., 2023).

Mixed ANOVA: Main Effects and Interaction

For each of the 11 PSDQ-S subscales, a 5 (Sport Group) $\times 3$ (Time) mixed ANOVA was conducted. Results are presented in Table 4 and show a coherent and statistically robust pattern across all subscales.

Main Effect of Sport Type (Between-Subjects)

The between-subjects effect of sport type was significant for all 11 subscales (all $ps < .001$), with effect sizes ranging from $\eta^2p = .13$ (Body Fat) to $\eta^2p = .29$ (Sport Competence). These correspond to medium-large and large effects by Cohen's (1988) benchmarks. The largest F values were found for Sport Competence, $F(4, 218) = 24.6$, $\eta^2p = .29$; Physical Activity, $F(4, 218) = 22.3$, $\eta^2p = .26$; and Coordination, $F(4, 218) = 19.8$, $\eta^2p = .24$, which are dimensions most directly linked to perceived athletic competence and where the separation between sport participants and non-participants was already marked at T0. The subscales with smaller between-subjects effects, specifically Body Fat, $F(4, 218) = 8.2$, $\eta^2p = .13$, and Health, $F(4, 218) = 9.7$, $\eta^2p = .15$, are dimensions less directly influenced by specific sport practice and more tied to general lifestyle factors.

Main Effect of Time (Within-Subjects)

The within-subjects effect of time was significant for 8 of 11 subscales ($p < .001$ or $p < .01$, with Greenhouse-Geisser correction applied where Mauchly's test indicated sphericity violation), with nonsignificant effects for Body Fat ($p = .089$), Health ($p = .074$), and Global Self-Esteem ($p = .061$) after Bonferroni correction. In this respect, careful interpretation is needed: the main effect of time averages across all groups, including the stable control group, which pulls overall means toward stability. Time effect sizes ranged from $\eta^2p = .05$ (Flexibility, Greenhouse-Geisser corrected, $\epsilon = 0.82$) to $\eta^2p = .13$ (Sport Competence).

Sport \times Time Interaction

The Sport \times Time interaction was significant for all 11 PSDQ-S subscales (all $ps \leq .01$), with effect sizes ranging from $\eta^2p = .06$ (Body Fat) to $\eta^2p = .15$ (Coordination, Endurance, Sport Competence).

These values indicate that the developmental trajectories of physical self-concept over the 12-month study period differed significantly across the five groups: sport groups showed systematic increases, while the control group remained stable. In particular, a significant interaction means that the effect of time on physical self-concept depends on the type of sport practiced, and each discipline generates a specific and identifiable change profile. A visual examination of the estimated marginal means showed four ascending monotonic trajectories for the sport groups from T0 to T1 to T2, with substantially linear increments, while the control group curve remained virtually flat across the entire observation period. The four sport group curves, while all ascending, were not parallel to each other, which testifies to discipline-specific differences in physical self-concept development profiles.

Post-Hoc Comparisons

Sport Groups Versus Control

All four sport groups differed significantly from the control group ($p < .001$, Bonferroni corrected) on all 11 PSDQ-S subscales at T2 (Table 5). Mean differences between sport groups and control ranged from 0.73 points (Body Fat: wheelchair basketball vs. control; 95% CI [0.41, 1.05]) to 2.04 points (Sport Competence: wheelchair basketball vs. control; 95% CI [1.72, 2.36]). The results highlighted that the superiority of sport participants was not confined to athletic dimensions of the physical self but extended across the full multidimensional spectrum of the PSDQ-S, including global self-esteem and perceived physical appearance. This indicates that participation in any form of structured adapted sport was associated with more positive self-perceptions regardless of the specific discipline.

Between-Discipline Comparisons

Selective differences between disciplines reflected the specific biomechanical demands of each sport. For Coordination, wheelchair basketball scored significantly higher than swimming ($\Delta = 0.33$, $p = .003$, 95% CI [0.08, 0.58]) and para-athletics ($\Delta = 0.19$, $p = .021$, 95% CI [0.02, 0.36]), but not martial arts ($\Delta = 0.05$, $p = .412$). For Endurance, swimming scored significantly higher than wheelchair basketball ($\Delta = 0.24$, $p = .012$, 95% CI [0.04, 0.44]) and martial arts ($\Delta = 0.37$, $p = .001$, 95% CI [0.14, 0.60]), but not para-athletics ($\Delta = 0.04$, $p = .741$). For Flexibility, swimming and martial arts did not differ ($\Delta = 0.02$, $p = .891$), but both scored significantly higher than wheelchair basketball ($ps = .002$ and $.004$, respectively). For Strength, wheelchair basketball scored significantly higher than swimming ($\Delta = 0.34$, $p = .001$, 95% CI [0.11, 0.57]) and para-athletics ($\Delta = 0.22$, $p = .015$, 95% CI [0.03, 0.41]). For Global Self-Esteem, no significant differences emerged among sport groups (e.g., wheelchair basketball vs. swimming: $\Delta = 0.11$, $p = .274$), though all sport groups differed significantly from the control (all $ps < .001$, $\Delta s = 1.17$ – 1.23).

Intraindividual Trajectory Analysis

To complement the group-level analyses, individual change scores ($\Delta T0$ – $T2$) on the PSDQ-S composite were computed for each participant. The distribution of individual changes in the four sport groups showed considerable variability around the group means: 78.3% of sport participants showed positive gains ($\Delta T0$ – $T2 > 0$), 14.1% showed stability ($|\Delta T0$ – $T2| \leq 0.10$), and 7.6% showed decreases. In the control group, the corresponding rates were 31.1%, 48.9%, and 20.0%, a distribution significantly different from that of the sport groups, $\chi^2(2) = 38.7$, $p < .001$. Sport participants showing negative or null changes were characterized by lower training frequency ($M = 2.1$ vs. 3.2 sessions/week; $t = 4.87$, $p < .001$), lower baseline self-determined motivation (RAI at T0: $M = 1.2$ vs. 2.8; $t = 5.23$, $p < .001$), and lower perceived satisfaction in teammate relationships ($M = 3.4$ vs. 4.6 on a 1–6 scale; $t = 4.12$, $p < .001$). The findings indicated that formal participation in adapted sport is not in itself sufficient to promote physical self-concept development: the quality of the sport experience, in terms of frequency, motivation, and relational context, seems to play an important moderating role.

Mediation Analysis

The mediation model (PROCESS Model 4; Hayes, 2018) tested whether self-determined motivation (RAI at T1) mediated the relationship between sport participation (X : 1 = sport, 0 = control) and physical self-concept (Y : PSDQ-S composite at T2), controlling for baseline self-concept at T0 (Table 6).

The a-path ($X \rightarrow M$) indicated that sport participation was associated with significantly higher self-determined motivation at T1 compared to the control condition, $b = 0.48$, $SE = 0.09$, $t = 5.33$, $p < .001$, 95% CI [0.31, 0.65]. The organizational and relational structures inherent in adapted sport, including training routines, bonds with teammates and coaches, competition, and measurable technical progress, seem to favor the development of internalized forms of motivation and reduce dependence on external and introjected regulators. The b-path ($M \rightarrow Y \mid X$) indicated that, controlling for sport type, self-determined motivation at T1 was a significant positive predictor of physical self-concept at T2, $b = 0.64$, $SE = 0.10$, $t = 6.40$, $p < .001$, 95% CI [0.44, 0.84]. Regardless of the specific discipline, participants who trained for more intrinsically self-determined reasons showed more positive physical self-perceptions over time.

The total effect was $b = 0.60$, $SE = 0.09$, $t = 6.67$, $p < .001$, 95% CI [0.43, 0.77], and the direct effect was $b = 0.29$, $SE = 0.11$, $t = 2.64$, $p = .009$, 95% CI [0.08, 0.50]. The indirect effect through self-determined motivation was $b = 0.31$, $SE = 0.08$, 95% bootstrap CI [0.17, 0.48], confirming significant partial mediation. The proportion of the total effect mediated was 52%, and the model explained substantial variance in both the mediator ($R^2 = .48$) and the outcome ($R^2 = .61$).

Moderated mediation (PROCESS Model 14) showed that sport experience significantly moderated the b-path: the $M \times$ Sport Experience interaction was significant, $b = 0.12$, $SE = 0.04$, $t = 3.00$, $p = .003$. The conditional b-path was stronger for participants with high sport experience (+1 SD: $b = 0.82$, $SE = 0.13$, $p < .001$) than for those with low sport experience (-1 SD: $b = 0.46$, $SE = 0.14$, $p = .001$). The conditional indirect effects were significant at all levels of the moderator: low sport experience, $b = 0.27$, 95% CI [0.13, 0.44]; medium, $b = 0.31$, 95% CI [0.17, 0.48]; high, $b = 0.39$, 95% CI [0.22, 0.58]. The results showed that the link between self-determined motivation and physical self-concept development becomes stronger with accumulated sport experience (Cai et al., 2025).

Cluster Analysis: Latent Physical Self-Concept Profiles

Hierarchical cluster analysis on standardized PSDQ-S scores (averaged across T0–T2), followed by k-means clustering, identified a three-cluster solution as optimal (Calinski-Harabasz coefficient = 312.7 for $k = 3$, vs. 267.4 for $k = 2$ and 289.1 for $k = 4$; jackknife kappa = .86, 95% CI [.81, .91]). Table 7 presents the mean profiles.

Cluster 1: High Integrated Physical Self-Concept ($n = 89$, 39.9%) was characterized by high and relatively homogeneous scores across all 11 subscales (range: 4.58–4.97), which indicates a consolidated and well-differentiated bodily representation. This cluster was predominantly composed of wheelchair basketball (44.9%) and para-athletics (38.2%) participants, with high mean sport experience ($M = 4.8$ years, $SD = 1.9$), high training frequency ($M = 3.5$ sessions/week), and predominantly competitive participation (89.9%). The label reflects the coherence between positive self-evaluation across physical dimensions, suggesting not only high perceived athletic competence but also a consolidated Paralympic sport identity.

Cluster 2: Specialized Physical Self-Concept ($n = 81$, 36.3%) was characterized by selectively high scores with discipline-specific peaks. Swimming participants in this cluster showed high Endurance ($M = 4.89$) and Flexibility ($M = 4.82$) but average Strength ($M = 4.12$), while martial arts participants showed peaks in Coordination ($M = 4.91$) and Flexibility ($M = 4.88$) with more moderate Endurance ($M = 4.31$). Mean sport experience was 3.4 years ($SD = 1.7$), intermediate between Clusters 1 and 3. The profile suggests a physical self-concept shaped specifically by the motor ecology of one's discipline, without the full integration and uniformity that characterize Cluster 1.

Cluster 3: Developing Physical Self-Concept ($n = 53$, 23.8%) was characterized by low-to-moderate scores across all subscales (range: 2.94–3.71). This cluster was predominantly composed of control group participants (54.7%) and sport participants with low sport experience ($M = 2.1$ years) or high practice discontinuity. Notably, Global Self-Esteem ($M = 3.71$) remained above the scale midpoint (3.5), suggesting that general positive self-regard was preserved even in the absence of a well-defined physical-athletic self. The remaining 45.3% of sport participants in this cluster were characterized by low training frequency or irregular attendance, indicating that formal membership in a sport group does not automatically guarantee the psychological benefits of adapted sport participation.

One-way ANOVAs comparing the three clusters on each subscale yielded significant differences for all comparisons (all $F_s > 134$, all $p_s < .001$; Table 7), with all post-hoc Bonferroni pairwise comparisons significant at $p < .001$, except the Cluster 1–Cluster 2 comparison for Flexibility ($p = .041$, $d = 0.28$).

Discussion

The present study aimed to compare the effects of different adapted sport disciplines on multidimensional physical self-concept in youth with motor disabilities, and to examine whether self-determined motivation mediates this relationship within the SDT framework. The results supported all four hypotheses and showed a coherent pattern in which structured adapted sport participation was associated with more positive physical self-perceptions over time. These effects appeared to unfold gradually over the 12-month observation period, were related to the quality of motivational engagement, and differed according to the specific demands of each sport discipline.

Replication and Extension of Scarpa (2011)

The most important finding of the present study is perhaps the confirmation of the sport–self-concept association in a longitudinal design. Scarpa (2011) showed that Italian youth with motor disabilities who practiced sport obtained higher PSDQ scores than their inactive peers, but the cross-sectional design used in that study made it impossible to rule out self-selection effects and did not allow for conclusions about whether sport actually improves physical self-concept over time. The present study adds a temporal dimension to this picture: sport participants not only scored higher than controls at T2, but their scores also increased over the 12 months of the study, while control scores remained essentially flat. This pattern of differential growth substantially strengthens the evidence for a genuine developmental effect of sport participation, although it is important to note that, in the absence of random assignment, fully causal conclusions are not possible. Even so, the shift from a cross-sectional to a longitudinal design represents a meaningful methodological advance and allows for a more confident interpretation of the findings.

The effect sizes obtained ($\eta^2 p = .13$ – $.29$) are noteworthy and, for some subscales, were larger than those typically found in the cross-sectional literature. It is plausible that the longitudinal design, by requiring sustained participation over 12 months, selected a sample with greater perseverance and deeper engagement with their sport. These findings are consistent with those reported by Isidoro-Cabañas et al. (2023), who found large effect sizes for adapted sport on both mental ($SMD = 0.71$, $p < .001$) and physical ($SMD = 1.03$, $p < .01$) quality of life, and with Puce et al. (2023), who found significantly higher hedonic well-being in para-athletes compared to non-sporting peers with disabilities (PGWBI composite: 72.02 ± 16.25 vs. 52.11 ± 15.16 ; $d = 1.25$) in a multicountry sample of 1,208 participants, with differences that were particularly pronounced for wheelchair basketball, para-athletics, and swimming. In a similar direction, Said and Alhumaid (2023), in a sample of 582 individuals with physical disabilities, found a significant positive association between physical activity volume and self-esteem ($\beta = .002$, $p < .001$), with 13–16% of variance explained. The consistency in the direction and size of these effects across different cultural contexts and measurement instruments suggests that the positive relationship between structured sport and

physical self-concept in persons with motor disabilities is a sufficiently robust phenomenon to warrant confidence in the present findings.

Sport-Specific Profiles: Biomechanical Resonance

Another important finding of this study concerns the differentiated self-concept profiles associated with each sport discipline. The finding that each discipline was associated with a recognizable pattern on the multidimensional PSDQ-S subscales, and that these patterns mapped onto the specific physical demands of each sport, extends the principle of practice-perception resonance to athletes with motor disabilities. This is not a trivial extension. It was theoretically plausible that motor disability might interfere with the construction of a differentiated physical self-concept and that the structure of self-perceptions would be less articulated or less responsive to specific practice experiences. The data showed the opposite. The sport context seemed to provide the necessary conditions for translating experiences of physical mastery into a differentiated body image that was consistent with the participant's sport history. In this context, sport practice can contribute to developing a positive and well-differentiated physical self-concept in persons with physical disabilities, as also suggested by Scarpa (2011).

The swimming group showed a distinctive profile in Endurance and Flexibility, which reflects the cardiorespiratory demands and joint mobility requirements of aquatic training. For many swimmers with motor disabilities, the aquatic environment represents a context in which terrestrial motor limitations are reduced, and experiences of physical competence can be particularly meaningful for the physical self. The aquatic environment also reduces gravitational load and provides clear proprioceptive feedback on joint movements, which may help swimmers develop a clearer sense of their own physical capacities. This interpretation is consistent with the qualitative work of Pack et al. (2017), who found that Paralympic swimmers reported a progressive identity shift from 'person with a disability who swims' to 'swimmer', and that this shift was closely linked to the embodied experience of aquatic competence.

The wheelchair basketball group showed higher scores in Strength and Coordination, which mirrors the upper-body power and complex motor coordination demands of wheelchair propulsion, shooting, and maneuvering. This result is in line with the findings of Qasim et al. (2019), who identified coordination as the strongest predictor of physical self-concept in wheelchair basketball players (85.9% variance explained), and also with Sarol (2024), whose analysis of 13 wheelchair basketball athletes showed that the perception of technical competence was closely related to intrinsic motivation and athletic identity. In this respect, it seems possible to assert that the specific physical demands of wheelchair basketball produce a specific pattern of physical self-perceptions that is consistent with the nature of the sport.

The martial arts group showed a more balanced profile, with comparable gains across Flexibility, Coordination, and Strength, and this is perhaps the most interesting of the sport-specific findings. The holistic nature of martial arts, which integrates force, coordination, flexibility, and balance in structured technical sequences, appeared to produce gains that were distributed across several dimensions of physical self-concept rather than concentrated in one or two areas. Furthermore, the progressive grading system used in martial arts provides structured and frequent feedback on mastery, which could probably be attributed to supporting the sense of personal competence and intrinsic motivation through concrete and proximal goal mechanisms that are well suited to adolescent development.

The Mediating Role of Self-Determined Motivation

The mediation analysis showed that self-determined motivation accounted for 52% of the total effect of sport participation on physical self-concept. This is the first empirical verification of this mechanism in a sample of youth with motor disabilities engaged in specific sports, and it has both theoretical and practical implications.

The partial rather than total mediation found in the present study suggests that there are two complementary pathways through which sport participation influences physical self-concept. The first is an indirect pathway through motivational internalization, which is consistent with SDT predictions (Deci & Ryan, 1985): sport participation promotes self-determined motivation, and this in turn promotes more positive physical self-perceptions through processes of self-attribution and identity construction. The second is a direct pathway that seems to operate through embodied proprioceptive feedback, physiological adaptations such as muscle tone and aerobic capacity, and shifts in social comparison within the sport group, where reference points are individuals with similar physical conditions (Pack et al., 2017). This dual-pathway interpretation is consistent with the findings of Schluchter et al. (2023), who found reciprocal relationships between motor competencies, physical activity, and sport-related self-concept in children with intellectual disabilities, and who suggested that the construction of physical self-concept is not reducible to a single linear mechanism.

The finding that sport experience moderates the motivation–self-concept link also has practical implications for intervention design: an experienced athlete who trains with intrinsic motivation seems to benefit more for the physical self-concept than a beginner with the same motivational profile (Cai et al., 2025). This suggests that motivational interventions may be more effective as athletes develop deeper engagement with their discipline, and that the early years of practice may be an important period for establishing the motivational foundations on which subsequent self-concept development can build. This picture is further enriched by Matelionytė (2026), who found that disability identity, athletic identity, and self-determined motivation functioned as mutually reinforcing components, suggesting a positive feedback system in which each component supports the others over time.

Cluster Analysis and Individual Variability

The three-cluster solution showed meaningful individual variability that group-level analyses alone could not capture. The High Integrated profile, which was more common among experienced wheelchair basketball and para-athletics athletes, was characterized by positive physical self-perceptions across all dimensions and a consolidated athletic identity. The Specialized profile, which was more typical of swimmers, showed a self-concept shaped by the specific demands of one's sport discipline without full cross-dimensional integration, and it may represent a developmental intermediate on the path from novice to integrated athlete. The Developing profile, which included primarily control participants and sport participants with low experience, showed that formal sport membership alone does not automatically produce psychological benefits. In this context, the presence of low-experience sport participants alongside non-athletes in this third cluster reinforces the idea that the positive effects of adapted sport participation require a minimum threshold of time and motivational quality to be fully expressed, and this has direct implications for program design and retention strategies in adapted sport organizations.

Limitations and Future Directions

Several methodological limitations should be acknowledged, as they constrain the generalizability of these findings. First, the observational design does not allow for definitive causal conclusions. Without random assignment to sport and control conditions, self-selection effects cannot be fully excluded, and it is plausible that individuals who choose to participate in adapted sport differ systematically from non-participants in ways that were not measured in the present study, such as personality variables, family support, or disability acceptance. The longitudinal design with control for baseline measures reduces this concern compared to cross-sectional designs, but does not eliminate it entirely. Future research should pursue randomized or quasi-experimental designs where ethically and practically feasible.

Second, the sample was geographically restricted to Northern Italy, and the results should be generalized cautiously. Sport federations and associations in this region may differ from those in

other parts of Italy and from those in other countries in structural characteristics such as economic resources, facility availability, coaching quality, and organizational culture, and all of these factors can influence the quality of the sport experience offered to participants. Replication across diverse geographic, cultural, and organizational contexts is therefore needed before the findings can be extended to the broader population of youth with motor disabilities.

Third, all outcome measures were based on self-report, and this introduces the possibility of social desirability bias, particularly in sport contexts where physical competence is closely linked to identity. The use of anonymized, self-administered questionnaires with clear instructions partially reduced this risk, but future studies should also include objective measures of physical capacity, such as standardized strength tests, aerobic capacity assessments, and flexibility measures, in order to examine the correspondence between perceived and actual physical competence and to better understand the role of proprioceptive feedback as a mediating mechanism.

Fourth, the present study did not include measures of coaching behavior, training environment quality, or peer relationship dynamics, and this makes it impossible to directly test the SDT prediction that autonomy-supportive coaching environments increase the motivational and self-concept benefits of adapted sport participation. Future studies that include such measures would allow for testing of multilevel models in which individual-level motivational processes are examined in relation to team-level coaching and environmental characteristics.

Future research priorities include extending follow-up periods beyond 12 months to examine long-term trajectories and possible ceiling effects; using multi-informant assessment strategies including coach ratings, peer nominations, and objective fitness testing; using cross-lagged structural equation models to examine reciprocal influences between self-concept, motivation, and sport engagement over time; including younger adolescents aged 10 to 12 years to examine whether the developmental plasticity of physical self-concept is greater during earlier identity formation stages; and systematically examining what happens to self-concept trajectories when athletes discontinue their sport participation.

Conclusion

In summary, the findings of the present study suggest that structured adapted sport participation is associated with positive developmental trajectories of multidimensional physical self-concept in adolescents and young adults with motor disabilities. Four main findings contribute to the existing literature and extend the cross-sectional evidence provided by Scarpa (2011).

First, the longitudinal design showed that physical self-concept improved over time in sport participants (+0.3 to +0.7 points on the PSDQ-5 scale over 12 months) while remaining stable in controls, and this pattern strengthens the evidence for a genuine developmental effect of sport participation that goes beyond what cross-sectional designs can show. This effect was found to be independent of disability type and appeared comparably in males and females.

Second, each adapted sport discipline was associated with a distinct self-concept profile that was consistent with its specific physical demands: swimming was associated with higher endurance and flexibility perceptions; wheelchair basketball was associated with higher strength and coordination self-concept; para-athletics was associated with higher physical activity and endurance self-perceptions; and martial arts was associated with a more balanced profile with comparable gains across flexibility, coordination, and strength. This sport-specific differentiation offers a practical basis for sport orientation, and could help practitioners match individuals to disciplines based not only on functional characteristics but also on targeted self-concept development goals.

Third, self-determined motivation partially mediated the sport-self-concept relationship and accounted for 52% of the total effect, with the mediation effect increasing with accumulated sport experience. This finding suggests that motivational quality is an important target for intervention and that participation in adapted sport alone is not sufficient to produce maximal benefits for physical self-concept; athletes also need to engage with their sport with self-determined, internalized motivations. In this respect, the present findings support the implementation of autonomy-

supportive coaching strategies that give athletes voice in decisions, promote self-reflection on motivations, and provide informational rather than controlling feedback.

Fourth, the cluster analysis showed that formal sport membership does not automatically guarantee self-concept benefits, as some sport participants with low experience showed profiles similar to those of non-athletes. This indicates that a minimum threshold of sustained and motivated practice is needed for the psychological benefits of sport to be fully expressed, and this has direct implications for retention programs and for the design of introductory sport experiences that can establish the motivational and relational foundations for long-term self-concept development.

Overall, the results of the present study suggest that adapted sport, practiced with adequate frequency and motivational quality, is an important context for developing positive physical self-perceptions in youth with motor disabilities, and these self-perceptions are a fundamental component of psychological well-being and identity formation. It seems possible to assert that the present data provide a solid empirical foundation for policies and practices aimed at expanding access to structured adapted sport opportunities and improving the psychological benefits of sport participation for this population.

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