

Systematic Review

Impact of Training Interventions on Physical Fitness in Children and Adolescent Handball Players: A Systematic Review and Meta-Analysis

Guillermo Barahona-Fuentes ^{1,2,†} , Claudio Hinojosa-Torres ^{3,†}, Sebastián Espoz-Lazo ⁴ ,
Juan Pablo Zavala-Crichton ³ , Guillermo Cortés-Roco ⁵ , Rodrigo Yáñez-Sepúlveda ³  and Fernando Alacid ^{6,*} 

¹ Núcleo de Investigación en Salud, Actividad Física y Deporte ISAFYD, Universidad de Las Américas, Viña del Mar 2531098, Chile; danielbarahonaf@gmail.com

² Escuela de Ciencias de la actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile (USACH), Santiago 9170022, Chile

³ Facultad de Educación y Ciencias Sociales, Universidad Andres Bello, Viña del Mar 2520000, Chile; claudio.hinojosa@unab.cl (C.H.-T.); jzavala@unab.cl (J.P.Z.-C.); rodrigo.yanez.s@unab.cl (R.Y.-S.)

⁴ Facultad de Educación, Pontificia Universidad Católica de Chile, Santiago 8520000, Chile; sebastian.espoz@uc.cl

⁵ Faculty of Life Sciences, Universidad Viña del Mar, Viña del Mar 2520000, Chile; guillermo.cortes@uvm.cl

⁶ Department of Education, Health Research Center, University of Almeria, 04120 Almeria, Spain

* Correspondence: falacid@ual.es

† These authors contributed equally to this work and share first authorship.

Abstract: Introduction: The developmental stage of handball training is critical for the enhancement of physical fitness. However, there is considerable methodological variability in the interventions implemented to improve performance in children and adolescents. Objective: This paper examines the characteristics and effectiveness of physical training interventions on fitness components in youth handball players through a systematic review and meta-analysis. The review identifies and classifies the types of strategies and training modalities used, while the meta-analysis quantifies their effects on physical performance. Methods: A systematic search was conducted in the databases Web of Science, Scopus, SPORTDiscus, PubMed, and MEDLINE, identifying 61 studies. Of these, fifty-three were included in the systematic review and eight met the criteria for the meta-analysis. The analysis focused on interventions targeting 787 participants aged 8 to 18 years (15.4 mean) and addressing various components of physical fitness. The methodological quality and risk of bias were assessed using the Cochrane Risk of Bias Tool. Results: The meta-analysis revealed significant and positive effects of the interventions on physical performance. Plyometric training was associated with improvements in peak power (SMD = 1.41; 95% CI: 0.91 to 1.91), sprint performance (SMD = −1.27; 95% CI: −1.93 to −0.62), and jump ability (SMD = 3.69; 95% CI: 3.21 to 4.17). Resistance band training also showed a positive impact on jump height (SMD = 1.56; 95% CI: 1.25 to 1.86) and agility (SMD = 0.42; 95% CI: 0.19 to 0.65). Heterogeneity ranged from low to moderate across outcomes. Conclusion: Plyometric and resistance band training interventions are effective strategies to enhance physical fitness in young handball players. These findings provide a scientific basis for designing evidence-based training programs aimed at comprehensive physical development during formative athletic stages.

Keywords: adolescents; children; handball; physical fitness; training



Academic Editor: Arkady Voloshin

Received: 30 April 2025

Revised: 21 May 2025

Accepted: 26 May 2025

Published: 31 May 2025

Citation: Barahona-Fuentes, G.; Hinojosa-Torres, C.; Espoz-Lazo, S.; Zavala-Crichton, J.P.; Cortés-Roco, G.; Yáñez-Sepúlveda, R.; Alacid, F. Impact of Training Interventions on Physical Fitness in Children and Adolescent Handball Players: A Systematic Review and Meta-Analysis. *Appl. Sci.* **2025**, *15*, 6208. <https://doi.org/10.3390/app15116208>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Handball has traditionally been described as a discipline of high physiological demand, characterized by the need to perform intermittent high-intensity actions such as sprints, decelerations, re-accelerations, jumps, throws, physical contacts, stops, and frequent changes in directions [1]. These specific demands of the game are particularly evident during competition periods [2], in which athletes must demonstrate a high capacity to repeat power effort in short recovery intervals [3]; to achieve this efficiently and sustainably, a solid foundation of physical conditioning is required, involving key capacities such as strength, speed, and endurance [4].

In this context, the literature has reported numerous studies focused on optimizing the physical preparation of adult players through various methodologies and intervention strategies; for example, the study by Hermassi et al. [5] demonstrated that a 12-week circuit-based training protocol can significantly improve jumping ability and aerobic endurance in handball players. Similarly, Aloui et al. [6] highlighted the benefits of resistance band training applied over eight weeks in combination with regular planning, achieving significant improvements in throwing power and upper body musculature without increasing muscle volume, which helps maintain the athlete's optimal weight. The most recent systematic reviews have identified high-intensity interval training (HIIT) as one of the most effective methods to improve VO_2max in sports with intermittent profiles. For instance, a study published in 2024 evaluated the effects of HIIT on university athletes practicing basketball, ecuavoley, and taekwondo, finding significant improvements in cardiovascular endurance, measured through VO_2max and duration in the shuttle run test [7]. Moreover, a 2022 study analyzed the effectiveness of HIIT in improving general fitness in school-aged students, concluding that this method is effective in enhancing VO_2max [8]. Although these studies are not focused exclusively on handball, their findings suggest that HIIT may be an effective strategy for improving VO_2max in intermittent sports [9]. In this regard, Henrique et al. highlights the predominance of this type of intervention in both research and professional training practice, due to its effectiveness in improving both aerobic and anaerobic endurance in an integrated way [10].

However, while the focus on performance during adulthood has been thoroughly documented, there is growing consensus on the need to understand how these capacities are built and developed from early ages [11–13]. The performance observed in adulthood is largely the result of a formative process that begins in childhood and continues through adolescence [14], where the development of physical capacities must be integrated with the acquisition of handball-specific technical and tactical skills [15]. This formative view demands long-term planning that considers the particularities of children's and adolescents' motor and physiological development [16]. Various authors have proposed the existence of developmental stages in athlete formation, structured according to chronological age and degree of biological maturity. According to the model proposed by Balyi and Hamilton, for example, children between the ages of 6 and 9 go through the so-called “train to move” stage, where the main objective is the development of fundamental motor skills and general movement patterns [17]. At this stage, physical conditioning should focus on developing general strength, contraction speed, and motor coordination [18,19], prioritizing a variety of stimuli and movement quality over early specialization [20]. It is a critical period for stimulating fast and mixed muscle fibers through sports tasks that also promote an initial understanding of the game [21].

With the onset of puberty, young athletes enter the “train to train” stage, during which more specific handball skills are consolidated and basic tactical elements such as off-the-ball movements, one-on-one actions, contact defense, game reading, and switching marks are introduced [22]. These skills must be executed at maximum speed over sustained

periods [23]. Coincidentally, this stage often overlaps with peak height velocity (PHV), implying significant morphological changes, such as the accelerated lengthening of body segments and a neuromuscular restructuring that requires the functional re-coordination of the body [24]. Subsequently, upon reaching higher-level competitive categories, players enter the “train to compete” stage, where the focus is no longer solely on development, but also on achieving results. Here, the complexity of technical–tactical tasks increases significantly, and a greater integration between the physical component and situational performance is required [25]. In this phase, physical training becomes more specific, including content such as maximum strength development (even with hypertrophy goals in certain cases) and improvement in the aerobic-anaerobic threshold, running speed, reaction time, and changes in direction [26,27]. Prioritizing these components not only impacts immediate performance but also shapes the athlete’s profile in the medium and long term [28].

Despite the growing body of scientific evidence on performance at advanced stages, there is still a gap in the literature regarding methodologies and intervention models for physical conditioning specifically designed for formative stages [29]. Most studies have focused on tactical proposals, an analysis of offensive and defensive systems, or physical interventions aimed at adults [30,31]. Of course, there are relevant works on injury prevention, physical performance improvement, and power development, but these mainly focus on athletes who have already reached biological maturity and a competitive level [32]. This mismatch highlights the need to broaden the research focus toward formative contexts, considering the specificity of handball and the characteristics of children’s and adolescents’ motor development. The absence of systematized and validated models for physical training at early stages represents a significant limitation for both coaches and curriculum designers in school and federative sports contexts [33]. As Manna et al. point out, training at these ages should adhere to the principle of developmental specificity, avoiding the premature application of high-performance methodologies [34].

Therefore, it is essential to establish a line of research that explores, validates, and disseminates physical training programs adapted to the developmental stages of children and young handball players. This line should consider variables such as relative load, stimulus density, difficulty progression, and integration of playfulness, without neglecting the technical and tactical aspects of the game. In this regard, a systematic review emerges as a suitable methodological tool to identify, analyze, and synthesize existing proposals in the scientific literature, allowing for the identification of trends, detection of gaps, and suggestion of future lines of action. Accordingly, the main objective of this systematic review is to compile, from the most relevant scientific databases, empirical research and academic documents that describe and evaluate methodologies for the development of physical and motor capacities in children and adolescents undergoing formative processes in the context of handball. Based on this compilation, the aim is to examine both the characteristics and the effectiveness of training interventions applied to youth handball players. The systematic review identifies and classifies the types of training approaches used, while the meta-analysis quantifies their effects on physical fitness outcomes in children and adolescents. This dual strategy not only synthesizes current scientific knowledge but also provides actionable insights to design effective, developmentally appropriate training programs formative stages.

2. Materials and Methods

2.1. Study Design

The following systematic review and meta-analysis were conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

guidelines [35] and were prospectively registered through the OSF registry, available at <https://doi.org/10.17605/OSF.IO/ZPR4G>.

2.2. Information Sources and Search Strategy

A systematic search was carried out in five electronic databases: Web of Science, Scopus, SPORTDiscus, PubMed, and MEDLINE, covering the period from each database’s inception until December 2024. The keyword combinations used Boolean operators OR/AND: (“handball” OR “team handball”) AND (“youth” OR “children” OR “adolescent”) AND (“training” OR “intervention”) AND (“strength” OR “plyometric” OR “resistance”) AND (“performance” OR “fitness”). Full details of the strategies are documented in the attached search matrix, (Supplementary Materials Table S1) available at <https://doi.org/10.6084/m9.figshare.29110022> (accessed on 25 May 2025).

2.3. Eligibility Criteria

The inclusion criteria were defined following the PICOS framework. Specifically, for this study, the population consisted of youth handball players aged 8 to 18 years, participating in federated, school-based, or competitive programs. The interventions had to include any type of structured physical training such as plyometric, strength, resistance band, speed, agility, or endurance programs. The comparator had to be either a control group with no intervention or an alternative intervention group. Regarding outcomes, studies needed to report quantitative pre- and post-intervention data on at least one physical fitness variable, such as jumping, speed, power, strength, agility, or endurance. Accepted study designs included experimental studies, such as randomized controlled trials and quasi-experimental designs. Exclusion criteria included studies conducted on adult populations, interventions focused exclusively on technical–tactical aspects, studies without a comparator group, protocols, narrative reviews, and those lacking sufficient data for qualitative or quantitative analysis. For clarity, the PICOS criteria are also summarized in Table 1.

Table 1. PICOS inclusion criteria.

Component	Criteria
Population	Youth handball players (aged 8–18 years)
Intervention	Structured physical training programs (e.g., plyometric, resistance, strength)
Comparator	No intervention or alternative training
Outcomes	Physical performance variables (e.g., jumping, sprint, strength, agility)
Study design	experimental studies, such as randomized controlled trials and quasi-experimental designs

2.4. Study Selection and Data Extraction Process

All records were managed using the Refworks reference manager (ProQuest), and the studies were processed in three stages: (i) duplicate removal, (ii) screening by title and abstract, and (iii) full-text review. Two independent researchers (B-F, G and H-T, C) performed the selection and data extraction in parallel. Discrepancies were resolved by consensus or by the intervention of a third reviewer (E-L, S), who made the final decision based on PICOS criteria. For each study, the following data were extracted: author, year of publication, country, participant characteristics (age, gender, sample size), type of intervention and comparator, duration and frequency of the program, measured variables, evaluation methods, and results.

2.5. Risk of Publication Bias Between Studies

The assessment of a publication bias was conducted exclusively within the meta-analytic component of this review. To evaluate potential asymmetry in the distribution of effect sizes, funnel plots were first examined visually. This qualitative inspection was then complemented by Egger's regression test [36], applied at a significance threshold of $p \leq 0.05$, to statistically detect small-study effects that may indicate a bias in the published data.

2.6. Methodological Quality and Risk of Bias Assessment

The methodological quality and risk of bias of each included study were evaluated using the revised Cochrane Risk of Bias Tool (RoB 2.0) [37], which provides a structured framework for assessing potential sources of bias across five key domains in randomized trials: (i) random sequence generation, (ii) allocation concealment, (iii) blinding of participants and assessors, (iv) incomplete outcome data, and (v) selective reporting. For each domain, a "Yes" response indicated a low risk of bias, "No" indicated a high risk, and "Unclear" indicated a possible bias due to a lack of information or uncertainty. The assessment was conducted by two independent reviewers.

2.7. Synthesis of Results and Statistical Analysis

Studies were eligible for inclusion in the meta-analysis if they implemented a structured physical training intervention in an experimental group and included a control group that received no additional training. Furthermore, only trials that reported pre- and post-intervention measurements of performance outcomes were considered. Those that did not meet these methodological criteria were excluded from the quantitative synthesis. To assess quality and interpret bias risk, version 5.4 of Review Manager (Copenhagen, Denmark: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014) was used. The same software was used to conduct both descriptive and inferential analyses within the meta-analysis. For each included study, effect sizes were computed by comparing outcomes between the experimental group, which received a structured physical training intervention, and the control group. Standardized mean differences (SMDs) were calculated using Hedges' g [38], with corresponding standard errors. The overall pooled effects and 95% confidence intervals (CIs) were estimated using inverse variance weighting. In parallel, unstandardized effect sizes (ESs) were derived by subtracting post-intervention means between groups and normalizing by the pooled standard deviation. The magnitude of effects was interpreted based on Cohen's thresholds: <0.2 (trivial), 0.2 – 0.5 (small), 0.5 – 0.8 (moderate), and >0.8 (large) [39]. Furthermore, for each pooled outcome, heterogeneity metrics were extracted and reported: Tau^2 , Cochran's Q , degrees of freedom, exact p -values, and I^2 percentages.

3. Results

The process of study identification and selection is described in Figure 1, following the PRISMA methodology. The systematic search in electronic databases yielded a total of 665 records. After removing 310 duplicates, 355 titles and abstracts were screened, of which 276 were excluded for not meeting the eligibility criteria. Subsequently, 79 full-text articles were assessed. Of these, 18 were excluded for various reasons, including populations outside the defined age range or the absence of a structured physical intervention. Finally, sixty-one studies were included in the qualitative synthesis (systematic review), and of these, eight met the methodological and statistical criteria to be included in the meta-analysis.

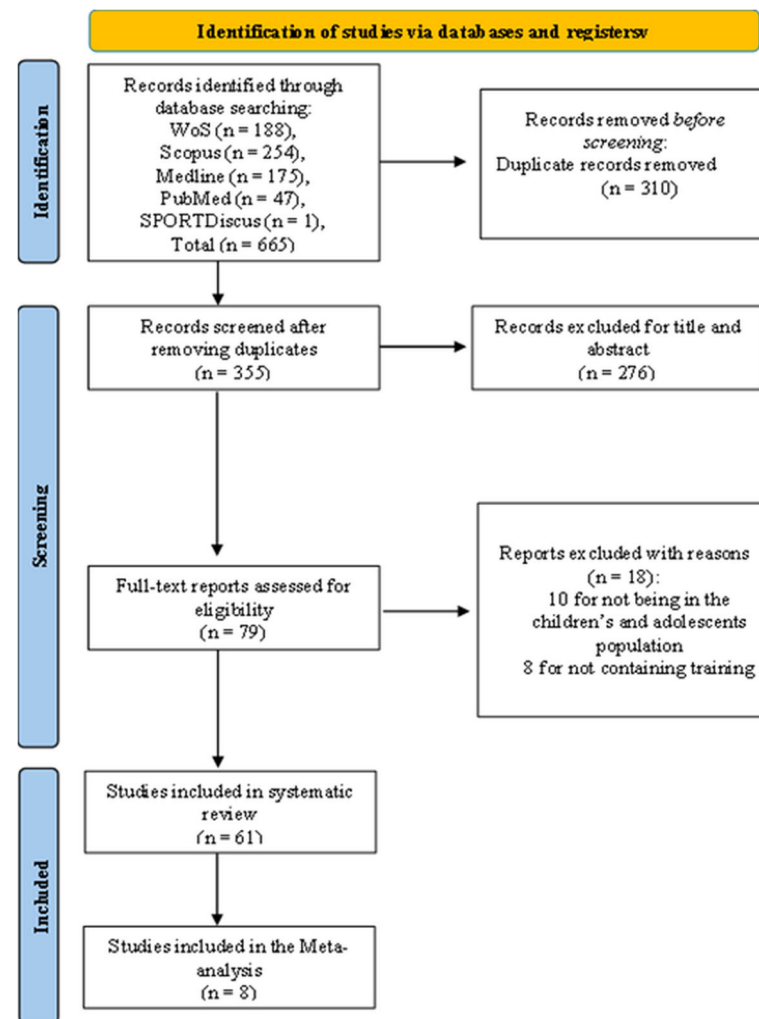


Figure 1. PRISMA flow diagram of articles that were selected.

3.1. Descriptive Results of the Systematic Review

A detailed summary of the 61 studies included in this systematic review is available in Supplementary Materials Table S2 (<https://doi.org/10.6084/m9.figshare.29110022> (accessed on 25 May 2025)). These studies were published between 2003 and 2024, with a marked increase over the past decade. They involved youth handball players aged between 10 and 18 years and were predominantly structured as randomized or quasi-experimental controlled trials. Intervention durations ranged from 4 to 16 weeks and included modalities such as plyometric training, elastic band training, resistance training, and small-sided games. The most commonly assessed outcomes were vertical jump performance (e.g., CMJ, SJ), sprint speed (10–30 m), change-of-direction ability, repeated sprint ability, throwing velocity, and strength measures.

Assessment of Methodological Quality and Risk of Bias of Individual Studies

The methodological assessment of the 61 studies included [40–100] in this review revealed significant differences in the quality of design and in how procedures were reported. Regarding selection bias, approximately half of the studies clearly described how they generated the random sequence—among them, Hammami et al. [65] and Aloui et al. [42]—while others, such as Zakas et al. [100] and Mascarenhas et al. [81], did not provide sufficient information, raising concerns about the validity of this process. A similar issue occurred with allocation concealment, which was poorly detailed in most studies, making it difficult to accurately evaluate this criterion. Performance bias related to the

blinding of participants and personnel was among the most common. In many studies, such as those by Haddad et al. [63] and Pancar et al. [88], no clear masking mechanisms were implemented, whereas only a few, such as Prieske et al. [91], reported specific procedures to control for this type of bias. Detection bias, associated with the blinding of outcome assessors, also showed variability: Gaamouri et al. [58] adequately reported this aspect, while studies such as Gorostiaga et al. [62] failed to mention it.

On the other hand, attrition bias was generally low. Most studies maintained adequate participant follow-up, and dropout rates were acceptable. With respect to reporting bias, most studies presented their main results; however, some, like Falch et al. [57], did not indicate whether they had a pre-registered protocol, which made it difficult to fully assess this aspect.

Finally, in relation to other biases, such as the disclosure of conflicts of interest, some studies were transparent—for instance, those by Hammami et al. [71]—while others, such as Jurisic et al. [79], did not provide any information in this regard. Overall, although a portion of the studies demonstrated strong methodological conduct across several domains, key weaknesses remain in areas such as blinding, allocation concealment, and transparency in conflict-of-interest declarations. These elements are described in Figure 2. Although the Cochrane Risk of Bias was used to systematically assess methodological quality, the included studies exhibited heterogeneity across several domains, particularly in randomization procedures, blinding of outcome assessors, and training load documentation. This variability limits the strength of some pooled estimates and could have contributed to residual bias in the overall synthesis. However, the use of a random-effects model, subgroup analyses by training modality, and the cautious interpretation of pooled results helped mitigate these risks. Future trials should aim to standardize key methodological elements and adhere to reporting standards to improve synthesis reliability in this field.

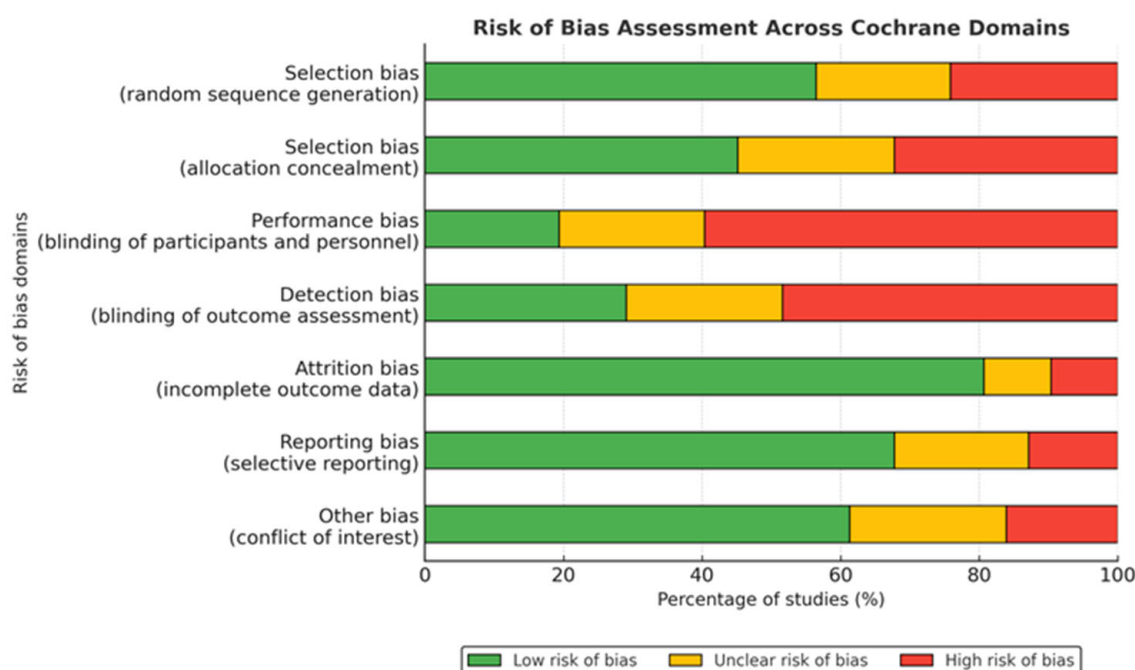


Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

3.2. Results of the Meta-Analysis

Eight studies with both experimental and control groups, reporting pre- and post-intervention data, were included in the meta-analysis. These studies were grouped and analyzed across four primary outcomes: (i) jump height (CMJ), (ii) peak power, (iii) sprint time, and (iv) jump height following elastic band training.

3.2.1. Risk of Bias Among Studies

Egger's analysis suggested that the primary variables evaluated in the studies that were part of the meta-analysis showed publication bias after plyometric training: (a) peak power: $z = 5.51$, $p < 0.00001$; (b) time sprint: $z = 3.81$, $p = 0.0001$; (c) jump height: $z = 15.09$, $p < 0.00001$; and (d) effect of elastic band training on jump height: $z = 10.05$, $p < 0.00001$ (Figure 3).

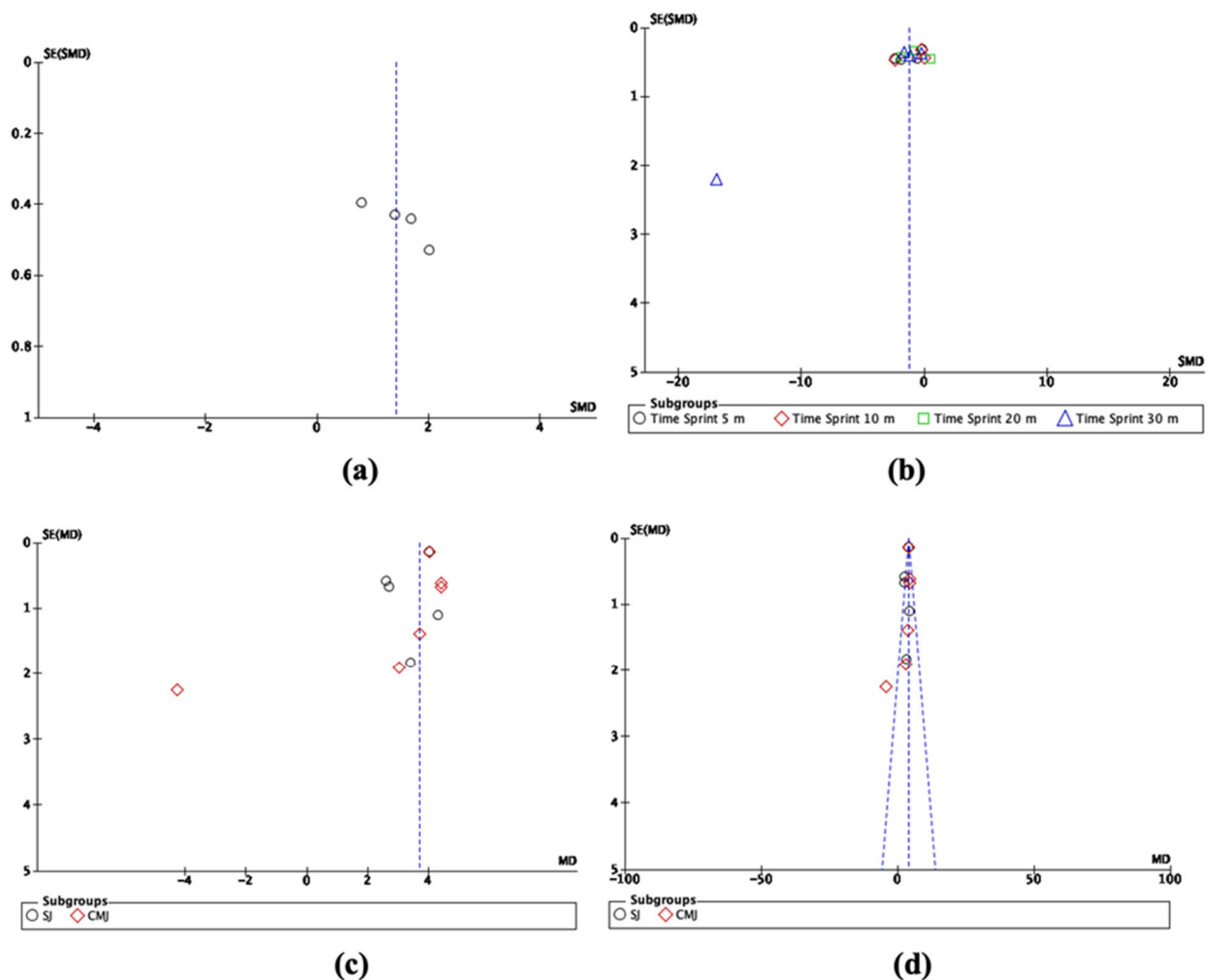


Figure 3. The standard error in different modes of training for peak power, time sprint, and jump height. (a) Plyometric training for peak power; (b) plyometric training for time sprint; (c) plyometric training for jump height; and (d) elastic band training on jump height; SE: standard error; SMD: standardized mean difference.

3.2.2. Effect of Plyometric Training on Peak Power

Four studies were included in the meta-analysis to evaluate the effect of plyometric training on peak power in handball players. The analysis showed a statistically significant effect in favor of the experimental group (SMD = 1.41; 95% CI: 0.91 to 1.91; $p < 0.00001$), indicating that the plyometric intervention led to substantial improvements in peak power output compared to the control group. The individual effect sizes of the studies are presented in Figure 4, ranging from 0.80 to 2.00. The study by Chelly et al. [52] reported the highest individual effect (SMD = 2.00; 95% CI: 0.97 to 3.04), followed by Aloui et al. [42] (SMD = 1.68; 95% CI: 0.82 to 2.54), while Pancar et al. [88] reported the lowest effect (SMD = 0.80; 95% CI: 0.03 to 1.58). All studies consistently favored the experimental group. Heterogeneity among studies was low ($I^2 = 25\%$; $\text{Chi}^2 = 3.99$, $df = 3$; $p = 0.26$), indicating acceptable variability across individual results. The Tau^2 value was 0.06, supporting the stability of the observed effect size. Overall, the results suggest that plyometric training is an effective intervention for improving peak power in handball players, demonstrating high consistency across studies and positive effects in all comparisons analyzed.

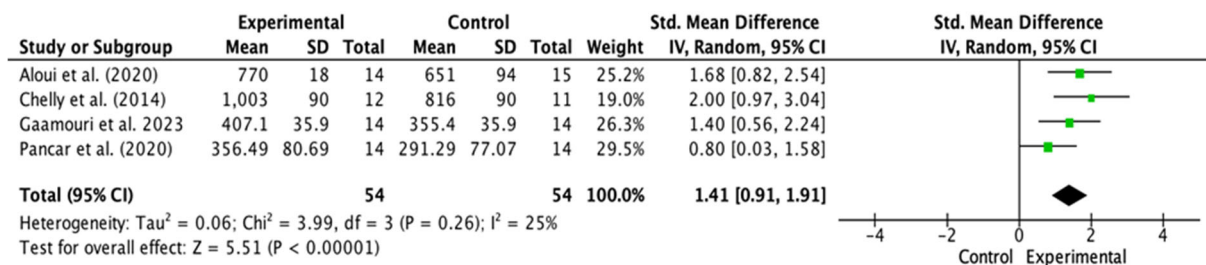


Figure 4. Forest plot comparing the effects of plyometric training on peak power levels. SD: standard deviation [42,52,58,88].

3.2.3. Effect of Plyometric Training on Time Sprint Performance

Fourteen comparisons grouped into four distances (5 m, 10 m, 20 m, and 30 m) were included to evaluate the effect of plyometric training on time sprint performance in handball players. The overall analysis presented in Figure 5 revealed a significant effect in favor of the experimental group (SMD = −1.27; 95% CI: −1.93 to −0.62; $p < 0.001$), indicating a consistent improvement in sprint times following the intervention. When disaggregated by distance, a statistically significant effect was observed in the 5 m test (SMD = −1.22; 95% CI: −2.29 to −0.15; $p = 0.03$), whereas no significant effects were detected at 10 and 20 m (SMD = −0.87; 95% CI: −2.24 to 0.51; $p = 0.22$ and SMD = −0.76; 95% CI: −2.00 to 0.48; $p = 0.23$, respectively). However, at the 30 m distance, a statistically significant and large effect was recorded (SMD = −3.15; 95% CI: −5.29 to −1.01; $p = 0.004$), suggesting greater sensitivity to the intervention in longer-duration sprints. Overall heterogeneity was high ($I^2 = 89\%$), and the test for subgroup differences was not significant ($\text{Chi}^2 = 3.91$; $p = 0.27$), indicating that although effect magnitudes varied, the direction of the effect remained consistent across the different distances analyzed. Studies such as those by Hammami et al. [65] and Pancar et al. [88] made notable contributions to the observed results, particularly in the longer sprint segments.

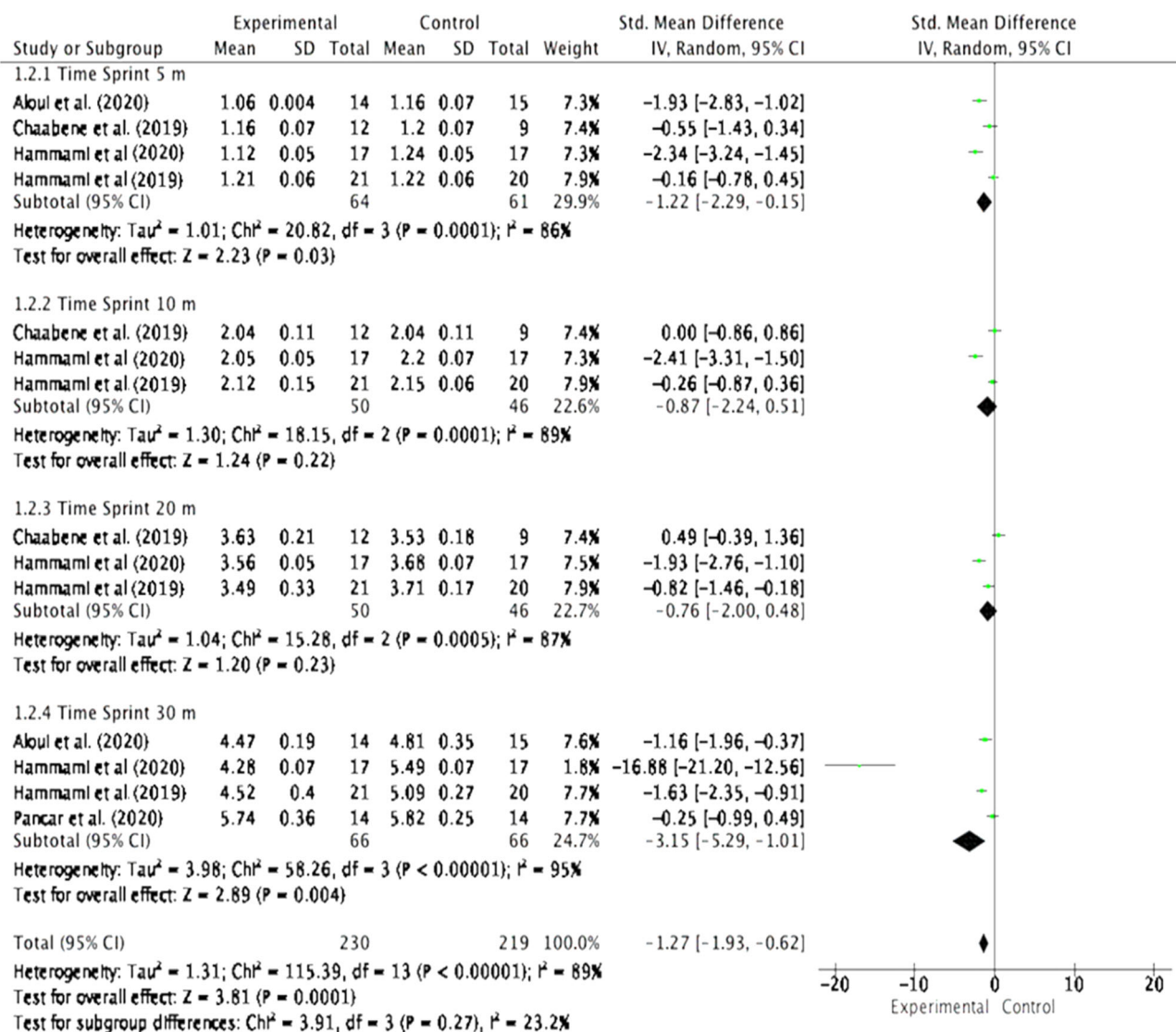


Figure 5. Forest plot comparing the effects of plyometric training on time sprint. SD: standard deviation [42,51,65,73,88].

3.2.4. Effect of Plyometric Training on Vertical Jump Performance

A total of eleven comparisons were included to evaluate the effect of plyometric training on vertical jump performance in handball players, specifically in two tests: countermovement jump (CMJ) and squat jump (SJ). The analysis presented in Figure 6 showed a statistically significant effect in favor of the experimental group ($SMD = 3.69$; 95% CI: 3.21 to 4.17; $p < 0.00001$), indicating a substantial improvement in jump performance following the plyometric intervention. The subgroup analysis by jump type revealed significant effects in both cases. For the SJ, an effect size of 3.41 was found (95% CI: 2.59 to 4.24; $p < 0.00001$) with moderate heterogeneity ($I^2 = 54\%$). Similarly, for the CMJ, the effect size was 3.67 (95% CI: 2.59 to 4.74; $p < 0.00001$), also with moderate heterogeneity ($I^2 = 66\%$). The test for subgroup differences was not significant ($\chi^2 = 0.13$; $p = 0.71$), suggesting that both jump types respond similarly to the intervention. The studies by Chelly et al. [52], Hammami et al. [65], and Gaamouri et al. [59] consistently contributed positive effects in both jump types, strengthening the overall effect. The global heterogeneity of the analysis was moderate ($I^2 = 58\%$), supporting the consistency of the findings despite the methodological diversity among the studies.

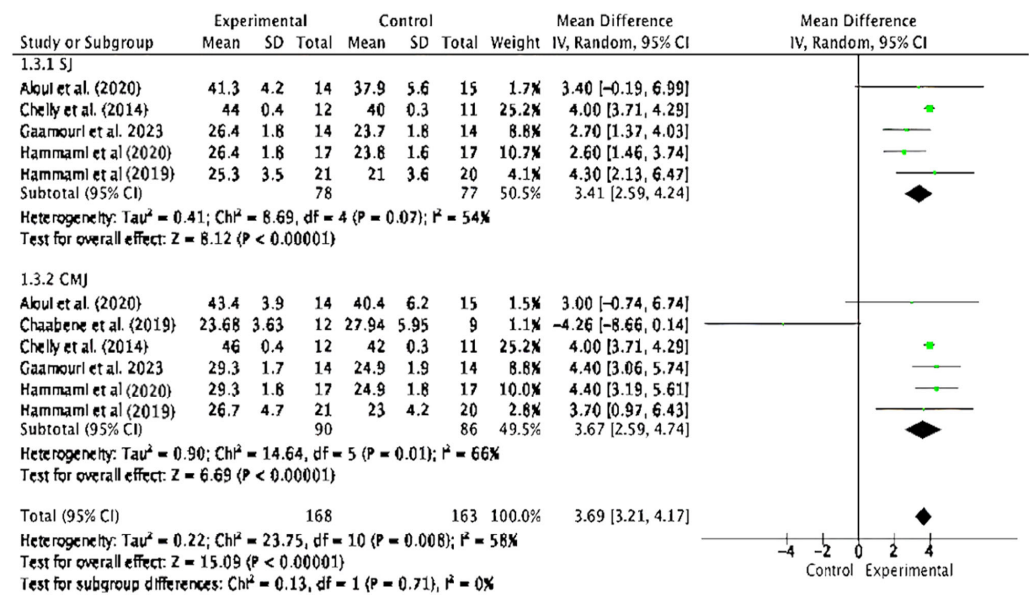


Figure 6. Forest plot comparing the effects of plyometric training on jump height. SD: standard deviation [42,51,52,58,65,73].

3.2.5. Effect of Resistance Band Training Program on Jump Performance

Eight comparisons were included, distributed across two subgroups of CMJ and SJ jump tests, with the aim of evaluating the effect of a resistance band training program on jump performance in handball players. Specifically, Figure 7 showed a significant effect in favor of the experimental group (SMD = 1.56; 95% CI: 1.25 to 1.86; $p < 0.00001$), indicating a robust improvement in jump performance following the resistance band intervention. In the CMJ subgroup, comprising four studies, a significant positive effect was observed (SMD = 1.69; 95% CI: 1.11 to 2.27; $p < 0.00001$), with moderate heterogeneity ($I^2 = 50\%$). In the SJ subgroup, also consisting of four studies, a significant effect was found (SMD = 1.46; 95% CI: 1.06 to 1.85; $p < 0.00001$), with no evidence of heterogeneity ($I^2 = 0\%$). The test for subgroup differences was not significant ($\chi^2 = 0.45$; $p = 0.50$), suggesting that both jump types respond similarly to resistance band training. Recent studies by Hammami et al. [71,72] and Gaamouri et al. [59,60] demonstrated consistent and relevant contributions in both jump types, strengthening the evidence of the positive impact of this training modality. The overall heterogeneity of the meta-analysis was low ($I^2 = 14\%$), further reinforcing the robustness of the results.

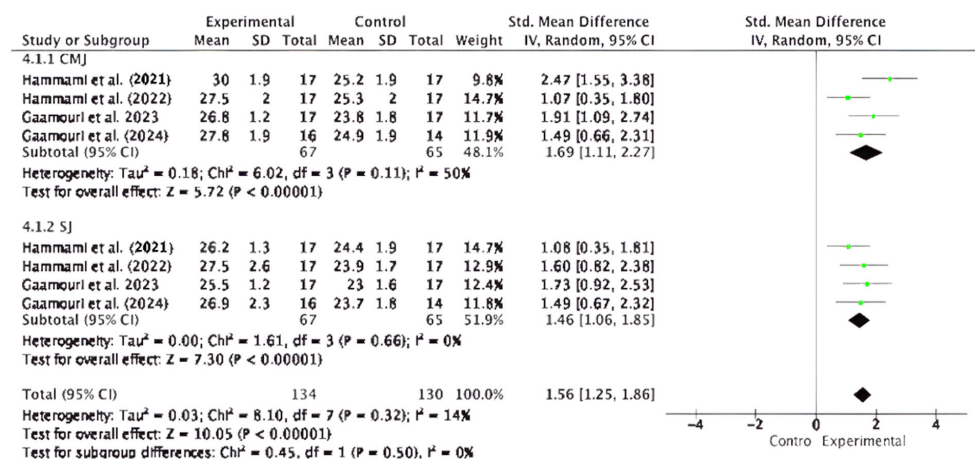


Figure 7. Forest plot comparing the effects of elastic band training on jump height. SD: standard deviation [59,60,71,72].

4. Discussion

The results of this systematic review and meta-analysis confirm that multiple physical training interventions can significantly improve physical performance in children and adolescents who practice handball. Among these, plyometric training and resistance band exercises stand out, having demonstrated substantial positive effects on key variables such as peak power, jump performance (CMJ and SJ), and sprint performance. Specifically, resistance band training showed robust improvements in both countermovement jump (SMD = 1.69) and squat jump (SMD = 1.46), with low heterogeneity ($I^2 = 14\%$), supporting the strength of the observed effects. These findings align with evidence reported in related sports contexts, such as basketball, where studies like Sáez de Villarreal et al. [101] documented improvements in vertical jump and anaerobic performance following plyometric interventions, and volleyball, where Agopyan et al. reported significant increases in jump power and spike speed in adolescent players after Thera-Band programs [102].

From a variable-specific perspective, plyometric training showed systematic improvements in peak power (SMD = 1.41), a central variable for executing explosive actions such as jumps, throws, and changes in direction. Regarding sprint performance, differentiated effects were observed, depending on the distance: significant improvements were noted in 5 m (SMD = −1.22) and 30 m sprints (SMD = −3.15), suggesting adaptations in both initial acceleration and sustained speed over longer distances. This pattern may be explained by progressive improvements in intermuscular coordination, the efficient recruitment of high-threshold motor units, and strengthening of the stretch-shortening cycle—physiological mechanisms widely recognized in the literature as outcomes of systematic exposure to plyometric stimuli [103,104]. These adaptations, far from being transient, represent structural and functional enhancements of the neuromuscular system, particularly relevant in developing populations where plasticity mechanisms are highly responsive to targeted stimuli.

Similarly, Aloui et al. [6] demonstrated comparable effects in adult handball players, suggesting that physiological adaptations related to strength and power can be safely and effectively induced from early developmental stages, provided that the training load design adheres to principles appropriate for children and youth. This approach contrasts with previous reviews focused on adult populations or technical-tactical interventions, without thoroughly addressing the specificity of physical training in childhood and adolescence. This distinction grants the present study added value and direct applicability for designing programs in formative categories. In terms of vertical jump performance, both CMJ and SJ showed positive responses to interventions, indicating the reinforcement of the stretch-shortening cycle, a core component in explosive movement efficiency.

In line with the emerging literature, resistance band interventions have been established as an effective and safe strategy for developing explosive physical qualities in young athletes, particularly in contexts with infrastructure limitations or low-impact requirements. Their low cost, portability, and ease of implementation make them highly accessible tools in schools, clubs, and training academies. Although previous studies, such as those by Montes-Salas et al., Agopyan et al., and Soto-García et al., have reported positive effects on vertical jump performance following programs incorporating or simulating resistance band characteristics [101,105,106], these findings should be interpreted with caution. Montes-Salas et al. [105], for instance, reported improvements in explosive strength and change in direction in youth handball players, but their systematic review design did not include a quantitative analysis of effects. Agopyan et al. [101] described significant increases in CMJ and peak power in volleyball players after eight weeks of Thera-Band training; however, applying these findings beyond volleyball presents limitations in generalizing results to handball. Similarly, Soto-García et al.'s [106] findings, focused on bodyweight and plyomet-

ric protocols without resistance bands, while relevant for their economical and functional approach, do not directly attribute benefits to this specific training modality.

In contrast, the results of this meta-analysis offer a substantially more robust and specific body of evidence. In particular, the eight comparisons on resistance band training in formative-stage handball players showed statistically significant and consistent improvements in vertical jump performance, both in CMJ (SMD = 1.69; 95% CI: 1.11 to 2.27) and SJ (SMD = 1.46; 95% CI: 1.06 to 1.85), with low to moderate heterogeneity levels (global $I^2 = 14\%$). This sustained and homogeneous effect reinforces the relevance of this intervention modality not only as a practical solution but also as an effective and scientifically validated strategy to enhance neuromuscular performance in young handball players. This underscores the need for the systematic incorporation of such interventions into physical training programs for developmental stages, especially in contexts with limited access to specialized equipment.

Despite the reported benefits, methodological limitations persist, affecting the strength of the results. A significant proportion of the studies included in this review exhibited deficiencies in essential experimental design aspects, such as the lack of participant and assessor blinding, allocation concealment, and absence of pre-established protocols. These omissions increase the risk of bias, particularly in performance and detection domains, as revealed by the Cochrane Risk of Bias Tool. Additionally, critical variables such as biological maturation or pubertal stage were not systematically considered, and most studies did not disaggregate results by gender, limiting the interpretation of subgroup-specific differences. This methodological gap hinders a precise understanding of training responses during sensitive developmental stages.

This scenario contrasts with sports like football and rugby, where studies such as Ferley et al. and Gabbett et al. have more rigorously integrated biological maturity control and standardized training load criteria [26,31]. These approaches have proven effective in reducing variability in training effects and enhancing practical transferability. Similarly, Lloyd and Oliver [24] emphasized the need to tailor interventions to the athlete's developmental stage, highlighting the urgency of adopting these criteria in youth handball.

Furthermore, heterogeneity in protocol planning (volume, frequency, duration, and intensity) poses another challenge. While partly reflecting the principle of individualized training, there is a pressing need for greater systematization to enable valid comparisons between studies and facilitate the practical application of the evidence.

From a developmental perspective, the findings of this review and meta-analysis clearly reinforce the necessity of designing physical training programs that align with the comprehensive developmental needs of children and adolescents. Rather than applying homogeneous approaches or replicating adult-oriented models, current evidence supports that interventions during formative stages must align closely with biological timing, motor development trajectories, and psychosocial conditions of young athletes. Models such as Long-Term Athlete Development (LTAD) emphasize that chronological age alone is insufficient as an organizing criterion for training, advocating for consideration of variables like biological maturity, sociocultural environment, and specific learning needs [24,105]. However, the studies analyzed in this review demonstrate the irregular implementation of these principles. Most do not incorporate objective measures of pubertal stage nor adjust training loads to participants' biological profiles, limiting both evidence quality and the potential for designing truly personalized and effective programs. Advancing toward greater systematization and coherence in intervention design is therefore not only desirable but essential. The effective integration of formative principles proposed by LTAD, along with progressive load criteria and contextual adaptability, is key to optimizing training effects and ensuring safe, sustained, and transferable physical development.

A relevant aspect emerging from this review is the limited integration between physical training content and the technical–tactical components of handball. This methodological separation represents a critical weakness, given that physical capacities—such as explosive strength, speed, or agility—are always expressed in situational contexts requiring decision-making, environmental adaptation, and coordinated execution under high variability. Consequently, training programs that artificially fragment these components risk generating adaptations that do not effectively transfer to real-game situations [107]. It is therefore essential for future research to advance toward integrated or contextualized approaches, where physical conditioning is developed through representative tasks aligned with handball’s internal logic and perceptual-motor demands.

From an applied perspective, the findings of this review offer valuable guidance for coaches, educators, and sports planners working with youth athletes. Plyometric and resistance band interventions, which showed positive effects on physical performance—particularly in vertical jump, power, and speed—can be progressively incorporated, provided that fundamental principles such as alignment with biological age, load management, and integration with technical content are respected. Their low cost and versatility make these strategies viable even in schools or clubs with limited infrastructure, without compromising stimulus quality.

Finally, it is imperative that future research addresses the key methodological gaps identified. Studies with greater experimental controls are recommended, incorporating longitudinal follow-ups to assess the sustainability of adaptations and considering moderating variables such as gender, bone age, pubertal stage, and competitive level. Additionally, it would be desirable to include functional indicators evaluating the transfer of physical improvements to situational performance, thereby validating training programs that are truly effective, safe, and adapted to the context of young handball players.

Comparative evidence from team sports such as football, rugby, and basketball consistently shows that targeted plyometric and resistance training enhances key physical capacities in youth athletes—namely sprint velocity, maximal strength, and change-in-direction performance [108–110]. These improvements are particularly notable when training programs are adapted to the athlete’s biological maturity, with plyometric methods proving especially effective prior to peak height velocity and combined modalities yielding greater benefits in post-peak height velocity stages [111]. In contrast, the literature on youth handball reflects a delayed and inconsistent incorporation of these principles. While developmental models such as the Long-Term Athlete Development (LTAD) framework and the Youth Physical Development Model have been formally integrated into the physical preparation systems of rugby and football federations [112,113], handball research continues to lack unified criteria for training periodization and load progression. Some recent contributions in handball have explored performance diagnostics and proposed multidimensional evaluation tools [114], yet these remain disconnected from broader developmental planning. Likewise, periodization studies in elite female players suggest potential advantages of block sequencing over traditional approaches [115], but without anchoring these findings in biological or pedagogical frameworks. This disconnect highlights a fundamental challenge: while other sports are aligning empirical research with applied models to guide training from early stages, handball remains fragmented in its developmental logic. Bridging this gap demands the systematic adoption of validated principles that consider growth, maturation, and sport-specific demands—not as peripheral variables, but as core pillars of youth performance planning.

5. Future Directions

Future studies should incorporate a broader range of moderating variables, such as biological maturation, gender, and training history, to better capture variability in training responsiveness during adolescence. It is also necessary to move toward the greater standardization of intervention protocols, explicitly detailing volume, intensity, frequency, and load progression criteria. Furthermore, future trials should prioritize longitudinal follow-up designs to assess the retention of training-induced adaptations and their transferability to real-game scenarios. Given the limitations in validity observed in several included trials, researchers are encouraged to develop and test integrated training models, where physical, technical, and cognitive demands are combined in sport-specific contexts. Studies should also explore the cost-effectiveness and scalability of different intervention models to facilitate implementations in school and community sport environments with limited resources.

6. Study Limitations

This review has several limitations that warrant consideration. Firstly, most included studies did not report on participants' biological maturity status, which may have influenced interindividual variability in training responsiveness. Secondly, data disaggregation by gender was lacking in many cases, precluding subgroup analyses that could reveal gender-specific adaptations. Thirdly, although methodological quality was generally acceptable, blinding procedures and allocation concealment were insufficiently detailed in many studies, increasing the risk of bias. Fourthly, subgroup analyses by age were not conducted due to the inconsistent reporting of mean ages and maturational stages across studies, which limits the ability to interpret training effects in early versus late adolescence. In addition, the high heterogeneity in training protocols (duration, frequency, load types, supervision) limits the ability to isolate the effect of specific program characteristics.

7. Conclusions

The present systematic review and meta-analysis provides strong evidence that plyometric and resistance band training interventions are effective in improving key physical fitness components (e.g., jump height, sprint speed, strength) in children and adolescent handball players. These interventions are particularly relevant due to their adaptability, low cost, and feasibility in diverse training contexts. However, the quality of evidence is moderated by methodological heterogeneity and a general lack of standardization in intervention design. Future research should prioritize experimental rigor, integration with technical-tactical training, and personalization based on developmental stages. By addressing these gaps, we can move toward more evidence-based, developmentally aligned, and contextually grounded training programs for youth athletes in handball. Nonetheless, the generalizability of these findings should be approached with caution. Most included studies focused on male adolescents aged 12 to 17 years, with limited data disaggregated by gender or maturational status. Moreover, the interventions were primarily delivered in structured environments—such as club-based or school sport settings—with trained supervision and access to basic equipment. For practical implementation, it is essential to ensure qualified oversight, individualized load progression, and adherence to fundamental movement quality standards. The applicability of these protocols in less controlled environments (e.g., community programs or school curricula) requires further investigation to validate their feasibility and safety.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/app15116208/s1>, Table S1: Search strategy, selection, and combination of keywords and their respective Boolean operators OR/AND. Table S2: Qualitative table that synthesizes and summarizes the studies included in the review.

Author Contributions: Conceptualization, G.B.-F., C.H.-T., S.E.-L., and R.Y.-S.; methodology, G.B.-F., C.H.-T., and S.E.-L.; software, G.B.-F., G.C.-R., and R.Y.-S. validation, J.P.Z.-C. and F.A.; formal analysis, G.B.-F., C.H.-T., and S.E.-L.; investigation, G.B.-F. and C.H.-T.; resources, J.P.Z.-C., G.C.-R., and F.A.; writing—original draft preparation, G.B.-F., C.H.-T., S.E.-L., and R.Y.-S.; writing—review and editing, J.P.Z.-C., G.C.-R., and F.A.; visualization, F.A.; supervision, R.Y.-S. and F.A.; project administration, C.H.-T. and S.E.-L.; funding acquisition, G.C.-R. and F.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Espoz-Lazo, S.; Hinojosa-Torres, C.; Fariás-Valenzuela, C.; Álvarez-Arangua, S.; Ferrero-Hernández, P.; Valdivia-Moral, P. Effects of a Self-Regulated Training Program on the Repeated Power in Female College Handball Players: An Intervention Study. *Int. J. Environ. Res. Public Health* **2021**, *18*, 12662. [\[CrossRef\]](#)
2. Ortega-Becerra, M.; Belloso-Vergara, A.; Pareja-Blanco, F. Physical and physiological demands during handball matches in male adolescent players. *J. Hum. Kinet.* **2020**, *72*, 253–263. [\[CrossRef\]](#)
3. Póvoas, S.C.; Seabra, A.F.; Ascensão, A.A.; Magalhães, J.; Soares, J.M.; Rebelo, A.N. Physical and physiological demands of elite team handball. *J. Strength Cond. Res.* **2012**, *26*, 3365–3375. [\[CrossRef\]](#)
4. García-Sánchez, C.; Navarro, R.M.; Karcher, C.; de la Rubia, A. Physical Demands during Official Competitions in Elite Handball: A Systematic Review. *Int. J. Environ. Res. Public Health* **2023**, *20*, 3353. [\[CrossRef\]](#) [\[PubMed\]](#)
5. Hermassi, S.; Laudner, K.; Schwesig, R. The Effects of Circuit Strength Training on the Development of Physical Fitness and Performance-Related Variables in Handball Players. *J. Hum. Kinet.* **2020**, *71*, 191–203. [\[CrossRef\]](#) [\[PubMed\]](#)
6. Aloui, G.; Hermassi, S.; Hayes, L.D.; Shephard, R.J.; Chelly, M.S.; Schwesig, R. Effects of Elastic Band Plyometric Training on Physical Performance of Team Handball Players. *Appl. Sci.* **2021**, *11*, 1309. [\[CrossRef\]](#)
7. Carvajal, V.C.M.; Arciniega, J.L.O.; Carvajal, E.P.M.; Urresta, E.M.M. Efectos del entrenamiento intermitente de alta intensidad en el rendimiento de los deportistas de los clubes de la Universidad Técnica del Norte. *LATAM Rev. Latinoam. Cienc. Soc. Humanidades* **2024**, *5*, 434–443. [\[CrossRef\]](#)
8. Huerta Ojeda, Á.; Galdames Maliqueo, S.; Cataldo Guerra, M.; Barahona Fuentes, G.; Rozas Villanueva, T.; Cáceres Serrano, P. Efectos de un entrenamiento intervalado de alta intensidad en la capacidad aeróbica de adolescentes. *Rev. Méd. Chile* **2017**, *145*, 972–979. [\[CrossRef\]](#)
9. Fritz, N. Efectos del entrenamiento en intervalos de alta intensidad en adultos mayores: Una revisión sistemática. *Cult. Cienc. Deporte* **2021**, *16*, 187–198. [\[CrossRef\]](#)
10. Henrique, J.R.; Ramirez-Campillo, R.; Fernandez, F.T.G.; Castillo, D.; Raya-González, J.; Zmijewski, P.; Silva, R.M.; Clemente, F.M. High-intensity interval training programs and their impact on endurance performance in handball players: A systematic review. *Biomed. Hum. Kinet.* **2024**, *16*, 113–130. [\[CrossRef\]](#)
11. Güllich, A.; Barth, M.; Hambrick, D.Z.; Macnamara, B.N. Participation patterns in talent development in youth sports. *Front. Sports Act. Living* **2023**, *5*, 1175718. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Kliethermes, S.A.; Marshall, S.W.; LaBella, C.R.; Watson, A.M.; Brenner, J.S.; Nagle, K.B.; Jayanthi, N.; Brooks, M.A.; Tenforde, A.S.; Herman, D.C.; et al. Defining a research agenda for youth sport specialisation in the USA: The AMSSM Youth Early Sport Specialization Summit. *Br. J. Sports Med.* **2021**, *55*, 135–143. [\[CrossRef\]](#) [\[PubMed\]](#)
13. Westerbeek, H.; Eime, R. The Physical Activity and Sport Participation Framework—A Policy Model Toward Being Physically Active Across the Lifespan. *Front. Sports Act. Living* **2021**, *3*, 608593. [\[CrossRef\]](#) [\[PubMed\]](#)

14. Thieschäfer, L.; Büsch, D. Development and trainability of agility in youth: A systematic scoping review. *Front. Sports Act. Living* **2022**, *4*, 952779. [\[CrossRef\]](#)
15. Spieszny, M.; Kamys, Z.; Kasicki, K.; Wasacz, W.; Ambroży, T.; Jaszczur-Nowicki, J.; Rydzik, Ł. The Impact of Coordination Training on Psychomotor Abilities in Adolescent Handball Players: A Randomized Controlled Trial. *Appl. Sci.* **2024**, *14*, 7974. [\[CrossRef\]](#)
16. Hrynchenko, I.; Tykhonova, A.; Karpunets, T.; Chupryna, O. Use of Active Games in Physical and Tactical Training of Young Handball Players at the Initial Stage. *Educ. Chall.* **2021**, *26*, 63–74. [\[CrossRef\]](#)
17. Balyi, I.; Hamilton, A. Long-term athlete development: Trainability in childhood and adolescence. *Olymp. Coach.* **2004**, *16*, 4–9.
18. Dabuleanu, V.; Simion, G.; Mihaila, I.; Mihailescu, L.; Popescu, C. Contributions regarding the improvement of specific physical training in 14–16 year-old handball players. *Ser. IX Sci. Hum. Kinet.* **2024**, *17*, 71–78. [\[CrossRef\]](#)
19. Ford, P.; Croix, M.D.S.; Lloyd, R.; Meyers, R.; Moosavi, M.; Oliver, J.; Till, K.; Williams, C. El modelo de desarrollo del atleta a largo plazo: Evidencia fisiológica y aplicación. *Rev. Cienc. Deporte* **2011**, *29*, 389–402. [\[CrossRef\]](#)
20. Muntianu, V.; Voinea, N. Psychomotor abilities in handball. Overview. *Sport and Society. Interdiscip. J. Phys. Educ. Sports* **2020**, *20*, 2. [\[CrossRef\]](#)
21. Furrer, R.; Hawley, J.A.; Handschin, C. The molecular athlete: Exercise physiology from mechanisms to medals. *Physiol. Rev.* **2023**, *103*, 1693–1787. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Mancha-Triguero, D.; Baquero, B.; Ibáñez, S.J.; Antúnez, A. Incidencia de la agrupación de los jugadores en el diseño de las tareas de entrenamiento en balonmano. *Retos* **2022**, *43*, 62–73. [\[CrossRef\]](#)
23. Sammoud, S.; Bouguezzi, R.; Uthoff, A.; Ramirez-Campillo, R.; Moran, J.; Negra, Y.; Hachana, Y.; Chaabene, H. The effects of backward vs. forward running training on measures of physical fitness in young female handball players. *Front. Sports Act. Living* **2023**, *5*, 1244369. [\[CrossRef\]](#)
24. Lloyd, R.; Oliver, J. The Youth Physical Development Model: A New Approach to Long-Term Athletic Development. *Strength Cond. J.* **2012**, *34*, 61–72. [\[CrossRef\]](#)
25. Peráček, P.; Peráčková, J. Tactical Preparation in Sport Games and Motivational Teaching of Sport Games Tactics in Physical Education Lessons and Training Units. In *Sport Pedagogy—Recent Approach to Technical-Tactical Alphabetization*; IntechOpen: London, UK, 2018. [\[CrossRef\]](#)
26. Ferley, D.D.; Scholten, S.; Vukovich, M.D. Combined sprint interval, plyometric, and strength training in adolescent soccer players: Effects on measures of speed, strength, power, change of direction, and anaerobic capacity. *J. Strength Cond. Res.* **2020**, *34*, 957–968. [\[CrossRef\]](#)
27. Stone, M.H.; Hornsby, W.G.; Suarez, D.G.; Duca, M.; Pierce, K.C. Training Specificity for Athletes: Emphasis on Strength-Power Training: A Narrative Review. *J. Funct. Morphol. Kinesiol.* **2022**, *7*, 102. [\[CrossRef\]](#)
28. Faude, O.; Rößler, R.; Junge, A. Football injuries in children and adolescent players: Are there clues for prevention? *Sports Med.* **2013**, *43*, 819–837. [\[CrossRef\]](#) [\[PubMed\]](#)
29. Rumpf, M.C.; Cronin, J.B.; Pinder, S.D.; Oliver, J.; Hughes, M. Effect of different training methods on running sprint times in male youth. *Pediatr. Exerc. Sci.* **2012**, *24*, 170–186. [\[CrossRef\]](#)
30. Impellizzeri, F.M.; Marcora, S.M.; Castagna, C.; Reilly, T.; Sassi, A.; Iaia, F.M.; Rampinini, E. Physiological and performance effects of generic versus specific aerobic training in soccer players. *Int. J. Sports Med.* **2005**, *27*, 483–492. [\[CrossRef\]](#)
31. Gabbett, T.J.; Jenkins, D.G.; Abernethy, B. Relationships between physiological, anthropometric, and skill qualities and playing performance in professional rugby league players. *J. Sports Sci.* **2011**, *29*, 1655–1664. [\[CrossRef\]](#)
32. Behm, D.G.; Faigenbaum, A.D.; Falk, B.; Klentrou, P. Canadian society for exercise physiology position paper: Resistance training in children and adolescents. *Appl. Physiol. Nutr. Metab.* **2008**, *33*, 547–561. [\[CrossRef\]](#)
33. Hinojosa-Torres, C.; Espoz-Lazo, S.; Fariás-Valenzuela, C.; Barraza-Gómez, F. Estrategias didácticas y metodológicas del proceso de formación en el balonmano escolar: Una revisión sistemática. *J. Sport Health Res.* **2021**, *13* (Suppl. S1), 1–14.
34. Manna, I. Growth development and maturity in children and adolescent: Relation to sports and physical activity. *Am. J. Sports Sci. Med.* **2014**, *2*, 48–50. [\[CrossRef\]](#)
35. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Egger, M.; Smith, G.D.; Schneider, M.; Minder, C. Bias in meta-analysis detected by a simple, graphical test. *BMJ* **1997**, *315*, 629–634. [\[CrossRef\]](#) [\[PubMed\]](#)
37. Higgins, J.P.; Savović, J.; Page, M.J.; Sterne, J.A. Revised Cochrane Risk-of-Bias Tool for Randomized Trials (RoB 2). In *Cochrane Handbook for Systematic Reviews of Interventions*; Wiley: Hoboken, NJ, USA, 2019.
38. Hedges, L.V. Distribution theory for Glass's estimator of effect size and related estimators. *J. Educ. Stat.* **1981**, *6*, 107–128. [\[CrossRef\]](#)
39. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*; Academic Press: Cambridge, MA, USA, 2013; ISBN 1483276481.

40. Akinci, Y.; Ateş, B. The Effects of School-Based Handball Intervention on 12–14-Year-Old Children's Physical Fitness and Performance. *Phys. Educ. Theory Methodol.* **2023**, *23*, 754–761. [\[CrossRef\]](#)
41. Alkasasbeh, W.J. Evaluation of Plyometric Exercise, Strength Training on Physical Capabilities. *Int. J. Hum. Mov. Sports Sci.* **2023**, *11*, 37–43. [\[CrossRef\]](#)
42. Aloui, G.; Hermassi, S.; Hammami, M.; Cherni, Y.; Gaamouri, N.; Shephard, R.J.; van den Tillaar, R.; Chelly, M.S. Effects of Elastic Band Based Plyometric Exercise on Explosive Muscular Performance and Change of Direction Abilities of Male Team Handball Players. *Front. Physiol.* **2020**, *11*, 604983. [\[CrossRef\]](#)
43. Bauer, J.; Schwietz, G.; Muehlbauer, T. Effects of an Elastic Resistance Band Intervention in Adolescent Handball Players. *Sports Med. Int. Open* **2021**, *5*, E65–E72. [\[CrossRef\]](#)
44. Bauer, J.; Muehlbauer, T. Effects of a 6 Week Core Strengthening Training on Measures of Physical and Athletic Performance in Adolescent Male Sub-Elite Handball Players. *Front. Sports Act. Living* **2022**, *4*, 1037078. [\[CrossRef\]](#)
45. Bělka, J.; Hůlka, K.; Šafář, M. Effect of Small-Sided Games and High-Volume Continuous Endurance Running on the Condition of Adolescent Female Handball Players in the Pre-Season. *Med. Dello Sport* **2022**, *75*, 16–28. [\[CrossRef\]](#)
46. Bouagina, R.; Padulo, J.; Fray, A.; Larion, A.; Abidi, H.; Chtara, M.; Chelly, M.S.; Khalifa, R. Short-Term in-Season Ballistic Training Improves Power, Muscle Volume and Throwing Velocity in Junior Handball Players. A Randomized Control Trial. *Biol. Sport* **2022**, *39*, 415–426. [\[CrossRef\]](#)
47. Buchheit, M.; Laursen, P.B.; Kuhnle, J.; Ruch, D.; Renaud, C.; Ahmaidi, S. Game-Based Training in Young Elite Handball Players. *Int. J. Sports Med.* **2009**, *30*, 251–258. [\[CrossRef\]](#) [\[PubMed\]](#)
48. Buchheit, M.; Mendez-Villanueva, A.; Quod, M.; Quesnel, T.; Ahmaidi, S. Improving Acceleration and Repeated Sprint Ability in Well-Trained Adolescent Handball Players: Speed Versus Sprint Interval Training. *Int. J. Sports Physiol. Perform.* **2010**, *5*, 152–164. [\[CrossRef\]](#)
49. Büsch, D.; Pabst, J.; Mühlbauer, T.; Ehrhardt, P.; Granacher, U. Effekte Plyometrischen Trainings Unter Verwendung Instabiler Untergründe Auf Sportmotorische Sprung-Und Schnelligkeitsleistungen von Nachwuchsleistungshandballern. *Sports Orthop. Traumatol.* **2015**, *31*, 299–308. [\[CrossRef\]](#)
50. Chaabene, H.; Negra, Y.; Moran, J.; Sammoud, S.; Ramirez-Campillo, R.; Granacher, U.; Prieske, O. The Effects of Combined Balance and Complex Training versus Complex Training Only on Measures of Physical Fitness in Young Female Handball Players 2 Running Head: Balance and Complex Training in Female Players. *Int. J. Sports Physiol. Perform.* **2019**, *16*, 1439–1446. [\[CrossRef\]](#)
51. Chaabene, H.; Negra, Y.; Moran, J.; Prieske, O.; Sammoud, S.; Ramirez-Campillo, R.; Granacher, U. Plyometric Training Improves Not Only Measures of Linear Speed, Power, and Change-of-Direction Speed But Also Repeated Sprint Ability in Female Young Handball Players. *J. Strength Cond. Res.* **2019**, *35*, 2230–2235. [\[CrossRef\]](#)
52. Chelly, M.S.; Hermassi, S.; Aouadi, R.; Shephard, R.J. Effects of 8-Week in-Season Plyometric Training on Upper and Lower Limb Performance of Elite Adolescent Handball Players. *J. Strength Cond. Res.* **2014**, *28*, 1401–1410. [\[CrossRef\]](#)
53. Chukhlantseva, N. Medicine Ball Training in the Sequence of Complex Handball Training versus Only Handball Training: Effects on Physical Fitness in Pre-Adolescence Female Handball Players. *Balt. J. Health Phys. Act.* **2023**, *15*, 2. [\[CrossRef\]](#)
54. Colado, J.C.; Garcia-Masso, X.; González, L.M.; Triplett, N.T.; Mayo, C.; Merce, J. Two-Leg Squat Jumps in Water: An Effective Alternative to Dry Land Jumps. *Int. J. Sports Med.* **2010**, *31*, 118–122. [\[CrossRef\]](#) [\[PubMed\]](#)
55. Daneshjoo, A.; Hoseinpour, A.; Sadeghi, H.; Kalantari, A.; Behm, D.G. The Effect of a Handball Warm-Up Program on Dynamic Balance among Elite Adolescent Handball Players. *Sports* **2022**, *10*, 18. [\[CrossRef\]](#)
56. Djordjevic, D.; Cubrilo, D.; MacUra, M.; Barudzic, N.; Djuric, D.; Jakovljevic, V. The Influence of Training Status on Oxidative Stress in Young Male Handball Players. *Mol. Cell. Biochem.* **2011**, *351*, 251–259. [\[CrossRef\]](#)
57. Falch, H.N.; Haugen, M.E.; Kristiansen, E.L.; van den Tillaar, R. Effect of Strength vs. Plyometric Training upon Change of Direction Performance in Young Female Handball Players. *Int. J. Environ. Res. Public Health* **2022**, *19*, 6946. [\[CrossRef\]](#)
58. Gaamouri, N.; Hammami, M.; Cherni, Y.; Rosemann, T.; Knechtle, B.; Chelly, M.S.; van den Tillaar, R. The Effects of 10-Week Plyometric Training Program on Athletic Performance in Youth Female Handball Players. *Front. Sports Act. Living* **2023**, *5*, 1193026. [\[CrossRef\]](#) [\[PubMed\]](#)
59. Gaamouri, N.; Hammami, M.; Cherni, Y.; Oranchuk, D.J.; Bragazzi, N.; Knechtle, B.; Chelly, M.S.; van den Tillaar, R. The Effects of Upper and Lower Limb Elastic Band Training on the Change of Direction, Jump, Power, Strength and Repeated Sprint Ability Performance in Adolescent Female Handball Players. *Front. Sports Act. Living* **2023**, *5*, 1021757. [\[CrossRef\]](#)
60. Gaamouri, N.; Hammami, M.; Cherni, Y.; Oranchuk, D.J.; van den Tillaar, R.; Chelly, M.S. Rubber Band Training Improves Athletic Performance in Young Female Handball Players. *J. Hum. Kinet.* **2024**, *92*, 227–238. [\[CrossRef\]](#) [\[PubMed\]](#)
61. Gómez-Álvarez, N.; Moyano, F.; Huichaqueo, E.; Veruggio, M.; Urrutia, V.; Hermosilla-Palma, F.; Pavez-Adasme, G. Effects of the Inclusion of Jump Exercises with and without External Overload in the Warm-up on Physical Performance Parameters in Young Handball Athletes. *MHSalud* **2020**, *17*, 49–63. [\[CrossRef\]](#)

62. Gorostiaga, E.M.; Izquierdo, M.; Iturralde, P.; Ruesta, M.; Ibañá Ez, J. Effects of Heavy Resistance Training on Maximal and Explosive Force Production, Endurance and Serum Hormones in Adolescent Handball Players. *Eur. J. Appl. Physiol. Occup. Physiol.* **2006**, *80*, 485–493. [\[CrossRef\]](#)
63. Haddad, M.; Prince, M.S.; Zarrouk, N.; Tabben, M.; Behm, D.G.; Chamari, K. Dynamic Stretching Alone Can Impair Slower Velocity Isokinetic Performance of Young Male Handball Players for at Least 24 Hours. *PLoS ONE* **2019**, *14*, e0210318. [\[CrossRef\]](#)
64. Hammami, M.; Gaamouri, N.; Aloui, G.; Shephard, R.J.; Chelly, M.S. Effects of a Complex Strength-Training Program on Athletic Performance of Junior Female Handball Players. *Int. J. Sports Physiol. Perform.* **2019**, *14*, 163–169. [\[CrossRef\]](#) [\[PubMed\]](#)
65. Hammami, M.; Ramirez-Campillo, R.; Gaamouri, N.; Aloui, G.; Shephard, R.J.; Chelly, M.S. Effects of a Combined Upper- And Lower-Limb Plyometric Training Program on High-Intensity Actions in Female U14 Handball Players. *Pediatr. Exerc. Sci.* **2019**, *31*, 465–472. [\[CrossRef\]](#)
66. Hammami, M.; Morgans, R.; Żmijewski, P. The Effects of Complex Elastic Band Training on Physical Fitness Components in Junior Female Handball Players. *Balt. J. Health Phys. Act.* **2024**, *16*, 11. [\[CrossRef\]](#)
67. Hammami, M.; Bragazzi, N.L.; Hermassi, S.; Gaamouri, N.; Aouadi, R.; Shephard, R.J.; Chelly, M.S. The Effect of a Sand Surface on Physical Performance Responses of Junior Male Handball Players to Plyometric Training. *BMC Sports Sci. Med. Rehabil.* **2020**, *12*, 26. [\[CrossRef\]](#) [\[PubMed\]](#)
68. Hammami, M.; Gaamouri, N.; Aloui, G.; Shephard, R.J.; Chelly, M.S. Effects of Combined Plyometric and Short Sprint with Change-of-Direction Training on Athletic Performance of Male U15 Handball Players. *J. Strength Cond. Res.* **2019**, *33*, 662–675. [\[CrossRef\]](#)
69. Hammami, M.; Gaamouri, N.; Ramirez-Campillo, R.; Shephard, R.J.; Bragazzi, N.L.; Chelly, M.S.; Knechtle, B.; Gaied, S. Effects of High-Intensity Interval Training and Plyometric Exercise on the Physical Fitness of Junior Male Handball Players. *Eur. Rev. Med. Pharmacol. Sci.* **2021**, *25*, 7380–7389. [\[CrossRef\]](#)
70. Hammami, R.; Nebigh, A.; Gene-Morales, J.; Rebai, H.; Colado, J.C. Speed Improves with Eccentric Hamstring Training in Athletes of Different Maturity Status. *Pediatr. Exerc. Sci.* **2022**, *34*, 99–107. [\[CrossRef\]](#)
71. Hammami, M.; Gaamouri, N.; Cherni, Y.; Gaied, S.; Chelly, M.S.; Hill, L.; Nikolaidis, P.T.; Knechtle, B. Effects of Complex Strength Training with Elastic Band Program on Repeated Change of Direction in Young Female Handball Players: Randomized Control Trial. *Int. J. Sports Sci. Coach.* **2021**, *17*, 1396–1407. [\[CrossRef\]](#)
72. Hammami, M.; Gaamouri, N.; Wagner, H.; Pagaduan, J.C.; Hill, L.; Nikolaidis, P.T.; Knechtle, B.; Chelly, M.S. Effects of Strength Training with Elastic Band Programme on Fitness Components in Young Female Handball Players: A Randomized Controlled Trial. *Biol. Sport* **2022**, *39*, 537–545. [\[CrossRef\]](#)
73. Hammami, M.; Gaamouri, N.; Suzuki, K.; Shephard, R.J.; Chelly, M.S. Effects of Upper and Lower Limb Plyometric Training Program on Components of Physical Performance in Young Female Handball Players. *Front. Physiol.* **2020**, *11*, 1028. [\[CrossRef\]](#)
74. Hammami, M.; Żmijewski, P. Comparative Analysis of Standard and Contrast Elastic Resistance Band Training Effects on Physical Fitness in Female Adolescent Handball Players. *Biol. Sport* **2024**, *41*, 119–127. [\[CrossRef\]](#) [\[PubMed\]](#)
75. Han, Z.; Zhou, H.; Teng, Y. Impacts of High-Intensity Interval Training on Physical Fitness in Handball. *Rev. Bras. Med. Esporte* **2023**, *29*, e2022_0618. [\[CrossRef\]](#)
76. Hermassi, S.; Ingebrigtsen, J.; Schwesig, R.; Fieseler, G.; Delank, K.S.; Chamari, K.; Shephard, R.J.; Chelly, M.S. Effects of In-Season Short-Term Aerobic and High-Intensity Interval Training Program on Repeated Sprint Ability and Jump Performance in Handball Players. *J. Sports Med. Phys. Fit.* **2018**, *58*, 50–56. [\[CrossRef\]](#) [\[PubMed\]](#)
77. Hernández-Davó, J.L.; Sabido, R.; Behm, D.G.; Blazevich, A.J. Effects of Resistance Training Using Known vs Unknown Loads on Eccentric-Phase Adaptations and Concentric Velocity. *Scand. J. Med. Sci. Sports* **2017**, *28*, 407–417. [\[CrossRef\]](#)
78. Ignjatovic, A.M.; Markovic, Z.M.; Radovanovic, D.S. Effects of 12-Week Medicine Ball Training on Muscle Strength and Power in Young Female Handball Players. *J. Strength Cond. Res.* **2012**, *26*, 2166–2173. [\[CrossRef\]](#)
79. Jurišić, M.V.; Jakšić, D.; Trajkovic, N.; Rakonjac, D.; Peulic, J.; Obradovic, J. Effects of Small-Sided Games and High-Intensity Interval Training on Physical Performance in Young Female Handball Players. *Biol. Sport* **2021**, *38*, 359–366. [\[CrossRef\]](#)
80. Madruga-Parera, M.; Bishop, C.; Fort-Vanmeerhaeghe, A.; Beato, M.; Gonzalo-Skok, O.; Romero-Rodríguez, D. Effects of 8 Weeks of Isoinertial vs. Cable-Resistance Training on Motor Skills Performance and Interlimb Asymmetries. *J. Strength Cond. Res.* **2020**, *36*, 1200–1208. [\[CrossRef\]](#)
81. Mascarenhas, L.; Cordeiro de Sousa, W.; Franz, J.; Lima de Abreu, V.; Decimo, J.; Cascante-Rusenhack, M.; Moncada-Jiménez, J. Effect of Strength Training on Body Composition, Strength and Aerobic Capacity of Brazilians Adolescents' Handball Players Related with Peak Growth Rate. *Arch. Med. Deporte.* **2016**, *23*, 239–243.
82. Mikalonytė, R.; Paulauskas, R.; Abade, E.; Figueira, B. Effects of Small-Sided Games vs. Simulated Match Training on Physical Performance of Youth Female Handball Players. *PLoS ONE* **2022**, *17*, e0273574. [\[CrossRef\]](#)
83. Nebigh, A.; Hammami, R.; Kasmi, S.; Rebai, H.; Drury, B.; Chtara, M.; van den Tillaar, R. The Influence of Maturity Status on Dynamic Balance Following 6 Weeks of Eccentric Hamstring Training in Youth Male Handball Players. *Int. J. Environ. Res. Public Health* **2022**, *19*, 9775. [\[CrossRef\]](#)

84. Nedić, O.; Šunderić, M.; Miljuš, G.; Valdevit, Z.; Jakovljević, V.; Glibetić, M.; Vučić, V. Preparatory Training Attenuates Drastic Response of the Insulin-like Growth Factor Binding Protein 1 at the Point of Maximal Oxygen Consumption in Handball Players. *J. Sport Health Sci.* **2017**, *6*, 372–377. [\[CrossRef\]](#) [\[PubMed\]](#)
85. Negra, Y.; Sammoud, S.; Bouguezzi, R.; Moran, J.; Chaabene, H. Effects of a Horizontal Speed Deceleration Training Programme on Measures of Physical Fitness in Youth Male Handball Players. *J. Sports Sci.* **2024**, *42*, 638–645. [\[CrossRef\]](#) [\[PubMed\]](#)
86. Noutsos, S.K.; Meletakos, P.; Athanasiou, P.; Tavlaridis, A.; Bayios, I. Effect of Plyometric Training on Performance Parameters in young Handball Players. *Gazz. Med. Ital.* **2023**, *180*, 568–574. [\[CrossRef\]](#)
87. Ozmen, T.; Aydogmus, M.; Yana, M.; Simsek, A. Effect of Core Strength Training on Balance, Vertical Jump Height and Throwing Velocity in Adolescent Male Handball Players. *J. Sports Med. Phys. Fit.* **2020**, *60*, 693–699. [\[CrossRef\]](#)
88. Pancar, Z.; Biçer, M.; Özdal, M. The Effects of 8-Week Plyometric Training on Anaerobic Power, Balance and Sprint Performance of 12-14 Aged Female Handball Players. *Med. Dello Sport* **2020**, *73*, 1–10. [\[CrossRef\]](#)
89. Parnow, A.; Derakhshandeh, S.; Hosseini, A. The Effect of 4-Week Difference Training Methods on Some Fitness Variables in Youth Handball Players. *Int. J. Appl. Exerc. Physiol.* **2016**, *5*, 3. [\[CrossRef\]](#)
90. Pori, P.; Martinc, D.; Šibila, M.; Štirn, I. The Comparison of the Unilateral and Bilateral Resistance Training in Young Handball Players. *Sport Sci. Health* **2023**, *19*, 691–700. [\[CrossRef\]](#)
91. Prieske, O.; Chaabene, H.; Puta, C.; Behm, D.G.; Büsch, D.; Granacher, U. Effects of Drop Height on Jump Performance in Male and Female Elite Adolescent Handball Players. *Int. J. Sports Physiol. Perform.* **2019**, *14*, 674–680. [\[CrossRef\]](#) [\[PubMed\]](#)
92. Sabido, R.; Hernández-Davó, J.L.; Botella, J.; Moya, M. Effects of 4-Week Training Intervention with Unknown Loads on Power Output Performance and Throwing Velocity in Junior Team Handball Players. *PLoS ONE* **2016**, *11*, e0157648. [\[CrossRef\]](#)
93. Saeterbakken, A.H.; Van Den Tillaar, R.; Seiler, S. Effect of Core Stability Training on Throwing Velocity in Female Handball Players. *J. Strength Cond. Res.* **2020**, *25*, 712–718. [\[CrossRef\]](#)
94. Madsen, M.; Ermidis, G.; Rago, V.; Surrow, K.; Vigh-Larsen, J.F.; Randers, M.B.; Larsen, M.N. Activity profile, heart rate, technical involvement, and perceived intensity and fun in U13 male and female team handball players: Effect of game format. *Sports* **2019**, *7*, 90. [\[CrossRef\]](#)
95. Triplett, N.T.; Colado, J.C.; Benavent, J.; Alakhdar, Y.; Madera, J.; Gonzalez, L.M.; Tella, V. Concentric and Impact Forces of Single-Leg Jumps in an Aquatic Environment versus on Land. *Med. Sci. Sports Exerc.* **2009**, *41*, 1790–1796. [\[CrossRef\]](#) [\[PubMed\]](#)
96. Vácsi, M.; Fazekas, G.; Pilissy, T.; Cselkó, A.; Trzaskoma, L.; Sebesi, B.; Tihanyi, J. The Effects of Eccentric Hamstring Exercise Training in Young Female Handball Players. *Eur. J. Appl. Physiol.* **2022**, *122*, 955–964. [\[CrossRef\]](#) [\[PubMed\]](#)
97. Van Den Tillaar, R.; Roaas, T.V.; Oranchuk, D. Comparison of Effects of Training Order of Explosive Strength and Plyometrics Training on Different Physical Abilities in Adolescent Handball Players. *Biol. Sport* **2020**, *37*, 239–246. [\[CrossRef\]](#) [\[PubMed\]](#)
98. Vicente-Rodriguez, G.; Dorado, C.; Perez-Gomez, J.; Gonzalez-Henriquez, J.J.; Calbet, J.A.L. Enhanced Bone Mass and Physical Fitness in Young Female Handball Players. *Bone* **2004**, *35*, 1208–1215. [\[CrossRef\]](#)
99. Vukadinovic Jurisic, M.D.; Aleksic Veljkovic, A.Z.; Obradovic, A.D.; Markovic, A.S.; Obradovic, J.M. The Effects of Different Training Programs on Agility Performance in Female Handball Players. *Med. Dello Sport* **2023**, *76*, 58–69. [\[CrossRef\]](#)
100. Zakas, A.; Vergou, A.; Grammatikopoulou, M.G.; Zakas, N.; Sentelidis, T.; Vamvakoudis, S. The Effect of Stretching during Warming-up on the Flexibility of Junior Handball Players. *J. Sports Med. Phys. Fit.* **2003**, *43*, 145.
101. de Villarreal, E.S.; Requena, B.; Cronin, J.B. The effects of plyometric training on sprint performance: A meta-analysis. *J. Strength Cond. Res.* **2012**, *26*, 575–584. [\[CrossRef\]](#)
102. Agopyan, A.; Ozbar, N.; Ozdemir, S.N. Effects of 8-week Thera-Band training on spike speed, jump height and speed of upper limb performance of young female volleyball players. *Int. J. Appl. Exerc. Physiol.* **2018**, *7*, 63–76. [\[CrossRef\]](#)
103. Markovic, G.; Mikulic, P. Neuro-Musculoskeletal and Performance Adaptations to Lower-Extremity Plyometric Training. *Sports Med.* **2010**, *40*, 859–895. [\[CrossRef\]](#)
104. Behrens, M.; Mau-Moeller, A.; Bruhn, S. effect of plyometric training on neural and mechanical properties of the knee extensor muscles. *Int. J. Sports Med.* **2013**, *35*, 101–119. [\[CrossRef\]](#) [\[PubMed\]](#)
105. Salas, C.M.; Santiago, M.V.; Pulgar, S.; Heres, M. Evaluación de los efectos del entrenamiento de fuerza con bandas elásticas en jugadores jóvenes de balonmano. Revisión sistemática. *E-Balonmano.Com: J. Sports Sci.* **2025**, *21*, 131–142. [\[CrossRef\]](#)
106. Soto-García, D.; Díaz-Cruz, J.; Bautista, I.J.; Martínez Martín, I. Efectos de un protocolo de entrenamiento de fuerza con autocargas y pliometría sobre el rendimiento físico en balonmano: Categoría de Primera Nacional Femenina. *E-balonmano.Com* **2022**, *18*, 83–92. [\[CrossRef\]](#)
107. Renshaw, I.; Davids, K.; Newcombe, D.; Roberts, W. *The Constraints-Led Approach: Principles for Sports Coaching and Practice Design*; Routledge: Oxfordshire, UK, 2019. [\[CrossRef\]](#)
108. Beato, M.; Bianchi, M.; Coratella, G.; Merlini, M.; Drust, B. Effects of plyometric and directional training on speed and jump performance in elite youth soccer players. *J. Strength Cond. Res.* **2018**, *32*, 289–296. [\[CrossRef\]](#)

109. McKinlay, B.J.; Wallace, P.; Dotan, R.; Long, D.; Tokuno, C.; Gabriel, D.A.; Falk, B. Effects of plyometric and resistance training on muscle strength, explosiveness, and neuromuscular function in young adolescent soccer players. *J. Strength Cond. Res.* **2018**, *32*, 3039–3050. [[CrossRef](#)]
110. Yáñez-García, J.M.; Rodríguez-Rosell, D.; Mora-Custodio, R.; González-Badillo, J.J. Changes in muscle strength, jump, and sprint performance in young elite basketball players: The impact of combined high-speed resistance training and plyometrics. *J. Strength Cond. Res.* **2022**, *36*, 478–485. [[CrossRef](#)]
111. Lloyd, R.S.; Radnor, J.M.; De Ste Croix, M.B.A.; Cronin, J.B.; Oliver, J.L. Changes in sprint and jump performances after traditional, plyometric, and combined resistance training in male youth pre- and post-peak height velocity. *J. Strength Cond. Res.* **2016**, *30*, 1239–1247. [[CrossRef](#)] [[PubMed](#)]
112. Lloyd, R.S. Long-term athletic development special topic issue. *Strength Cond. J.* **2020**, *42*, 1. [[CrossRef](#)]
113. Perreault, M.E.; Gonzalez, S.P. Generalize over specialize: Examining the long-term athlete development model to optimize youth athlete development. *Strategies* **2021**, *34*, 11–15. [[CrossRef](#)]
114. Romero, F.P.; Angulo, E.; Serrano-Guerrero, J.; Olivas, J.A. A fuzzy framework to evaluate players' performance in handball. *Int. J. Comput. Intell. Syst.* **2020**, *13*, 549–558. [[CrossRef](#)]
115. Manchado, C.; Cortell-Tormo, J.M.; Tortosa-Martínez, J. Effects of two different training periodization models on physical and physiological aspects of elite female team handball players. *J. Strength Cond. Res.* **2018**, *32*, 280–287. [[CrossRef](#)] [[PubMed](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.