

# Ups and Downs of Trampoline Use by Children: Risks and Current Recommendations

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## Abstract

The widespread increase in the recreational use of trampolines by children can be partially explained by the recent need to stay indoors during lockdowns due to the coronavirus disease 2019 pandemic. At the same time, there was a global increase in the number of pediatric accidents resulting from the domestic use of these devices. The resulting injuries may be severe, especially in younger age groups. Although the use of trampolines by children is discouraged in safety recommendations published by several scientific societies and some recent studies, there is still concern about the lack of knowledge about the risks of trampoline-related injuries. In this regard, this review article aimed to highlight the unique role of the pediatrician and/or family physician advising parents and caregivers as well as the general population to prevent trampoline-related accidents involving children.

**Keywords:** Accident Prevention; Athletic Injuries; Child; Child, Preschool; Play and Playthings/injuries; Wounds and Injuries/epidemiology

## Keypoints

### What is known:

- Recreational trampoline use is becoming increasingly popular among children.
- Trampoline-related injuries can be particularly severe in younger age groups.
- The information available in Portugal about the risks associated with trampolines is scarce.

### What is added:

- Trampoline use is a high-risk activity with multiple associated mechanisms of injury.
- Scientific societies advise against its use by children, especially those below six years old.
- Pediatricians and family physicians play a unique role in the education of caregivers about the prevention of trampoline-related accidents.

## Introduction

As a result of the coronavirus disease 2019 (COVID-19) pandemic and its mandatory lockdown measures, such as school closures, suspension of sports activities, and social distancing, Portuguese families have spent more time at home. In response to the need for entertainment, particularly for younger children, alternatives were sought, including playing with trampolines.

The recreational use of trampolines at home has become increasingly popular, driven by the novelty, marketing, and availability of inexpensive domestic devices. Trampoline parks and the presence of trampolines in playgrounds, including school playgrounds, are also emerging concerns. Indeed, parents and caregivers have been asking about the appropriate age, the benefits,

and the possible risks related to its use during pediatric consultations.

### Trampoline-related injuries

Trampoline-related injuries are increasing with a significant potential of severity in all age groups.<sup>1</sup> These injuries can be more serious than the ones caused by other sports activities,<sup>2</sup> especially in younger children, thereby representing a public health problem. The literature review has revealed a global decrease in overall pediatric trauma during the pandemic period. However, there was a relative increase in accidents occurring at home, including those specifically associated with trampolines. Children under 6 years old were the main risk group.<sup>3-5</sup>

In the pre-pandemic period, some studies had already

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warned about the dangers related to the use of these devices by children, in whom internal organ and soft tissue injuries are more common, especially children below two years old.<sup>6</sup> The incidence rates and types of pediatric fractures between 2020 and 2018-2019 (pre-COVID period) were compared and it was concluded that the absolute incidence rate of bone fractures had decreased by 60% in 2020. However, it was found that a 12% increase was reported in those that fractures occurred from high-energy falls, particularly from trampoline accidents.<sup>5</sup>

The most frequent trampoline-related injuries are fractures, mainly extremities fractures.<sup>6,7</sup> Upper extremities fractures are associated with home accidents and lower fractures are more frequent in recreational parks.<sup>6</sup> The axial force generated during jumping, which increases even more if there are two participants jumping simultaneously, causes pathognomonic fractures, such as the proximal tibia fracture, that disproportionately affect children below six years old (Table 1).<sup>4,7</sup>

The major mechanisms of injury are inappropriate falling on the trampoline mat or other components (eg circular frame, springs, bungee loops, posts, and hooks) (Fig. 1), falling on the surrounding floor, and collision with another person on the trampoline.<sup>7,8</sup> The simultaneous use by two or more children, especially if

they have different sizes, carries a risk of injury 14 times higher for the smaller child.<sup>4</sup> Therefore, surrounding nets and cushions and parental supervision do not prevent most accidents.

Some studies have reported different injury characteristics based on the use of these devices at home and in recreational parks.<sup>7</sup> Home trampolines may even be more dangerous and associated with more serious injuries, including head and neck injuries, soft tissue lacerations, and fractures. The most frequent indoor accidents are collisions with another participant and falling off the trampoline bed. The different designs of the domestic trampoline from those in parks, lack of supervision, and its use by more than one participant are some factors that may explain this phenomenon.<sup>4,7</sup> Home injuries prevail at younger ages, while adolescence is pointed as a risk factor for serious injuries mostly in recreational parks.<sup>6,7</sup> Some acrobatics moves, such as somersaults, can result in spinal hyperflexion injuries and consequent neurological damage, including cervical spine injuries.<sup>8</sup>

### Safety recommendations

The use of trampolines by children is consensually discouraged in safety recommendations published by several scientific societies.<sup>1,8,9</sup> The American Academy of

Table 1. Trampoline related injuries

Type of injury	Most frequent mechanisms of injury	Most frequent age range (years)	Frequency of specific injury (%)
Fractures	1. Fall on the trampoline 2. Involving another jumper 3. Direct impact on the ground 4. Collision with the frame <sup>7,14</sup>	< 6 <sup>2,7,8</sup> , 5-9 <sup>11</sup> 2-6 <sup>14</sup>	27-75 <sup>2,4,6,7,11-15</sup> 40-47 HTI vs 42-59 TPI <sup>13,15</sup>
	1. Fall on the trampoline 2. Twisted ankle or knee <sup>7</sup>	> 6 <sup>7</sup>	33 <sup>6</sup> 28 HTI vs 38 TPI <sup>7</sup>
	Multiple mechanisms	< 2 <sup>6</sup>	14-40 <sup>4,6</sup> 15 TPI vs 26 HTI <sup>7</sup> 31 HTI vs 55 TPI <sup>15</sup>
	Somersaulting or flips <sup>7,8</sup>	Adolescence	3-16 <sup>12,13</sup>
	> 6 <sup>7</sup>	2-8 <sup>7,12,13,15</sup>	
Lower extremities	1. Involving another jumper 2. Chronic repetitive changes <sup>14</sup>	2-5 (proximal tibia fractures) <sup>14</sup>	34-54 <sup>4,6,11,12,15</sup> 33-36 HPI vs 58-72 TPI <sup>7,13</sup>
	1. Direct impact on the ground 2. Collision with other jumper or with the frame <sup>14</sup>		31-56 <sup>4,6,11,12,14,15</sup> 16-25 TPI vs 32-64 HPI <sup>7,13</sup>
	1. Falls from the trampoline <sup>8</sup>	> 6 <sup>7</sup>	3-17 <sup>12,15</sup> 12 TPI vs 18 HPI <sup>7</sup> 22 <sup>6</sup> * 19 <sup>12</sup> †
			1-6 <sup>12,15</sup> 8 HTP vs 9 TPI <sup>7</sup>
Upper extremities			
Head			
Thorax and abdomen			

HTI - home trampoline injuries; TPI - trampoline park injuries.

\* includes head and neck injuries.

† includes head and spine injuries.





A - trampoline mat; B - circular frame pad, springs and hooks; C - posts; D - falling of the trampoline.  
**Figure 1.** Main injury sites on a trampoline.  
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Pediatrics is against the recreational use of trampolines by children. It recommends that if they are used, there should be constant adult supervision, adequate protective padding, non-permission of more than one user at a time, and prevention of jumps known as somersaults.<sup>8</sup>

The American Academy of Orthopedic Surgeons supports these guidelines and does not recommend the use of trampolines by children below six years old.<sup>1</sup> The Canadian Paediatric Society also advises against children using trampolines recreationally at home, pointing out that adequate supervision does not prevent all injuries.<sup>9</sup> Despite not raising all of these risks, the Associação para a Promoção da Segurança Infantil, in Portugal, includes several tips for families who decide to purchase a trampoline for their homes in its digital safety guide.<sup>10</sup> The perception from clinical practice, confirmed by literature suggests that many parents and caregivers are not aware of the dangers of trampolines.<sup>4</sup> With the increasing popularity of their use at home and the obligation to spend more time at home during the pandemic, more accidents involving children are likely to occur, which may be perpetuated in the future. However, there is a lack of awareness in families, schools, and health professionals regarding the inherent risks and published recommendations. Moreover, the information available for consultation in Portugal is scarce.

## Conclusion

With the reopening of schools as well as sport and recreational centers, including trampoline parks, awareness-raising and prevention measures should be adopted in these places. Continuous surveillance of trampoline accidents will enable us to understand the associated risks and develop injury prevention measures.

The currently available literature is consensual in considering the use of trampolines by children as a high-risk activity, especially by those below six years old, which should not be ignored.

This article aimed to highlight the role of pediatricians and family physicians in informing and educating parents or caregivers about the risks associated with trampolining, both at home and in other social settings and warning them to adopt necessary safety measures. A risk reduction-based approach may begin with the discouragement of their use by children as well as the prohibition of their use by children below six years old.

## Author Contributions

MAR participated in the study conception or design. MLT, IBV and MAR participated in acquisition of data. MLT, IBV and MAR participated in the analysis or interpretation of data. MLT, IBV and MAR participated in the drafting of the manuscript. MAR participated in the critical revision of the manuscript. All authors approved the final manuscript and are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this study.

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## Confidentiality of data

The authors declare that they have followed the protocols of their work center on the publication of patient data.

## Consent for publication

Consent for publication was obtained.

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### Altos e Baixos do Uso de Trampolins Pelas Crianças: Riscos e Recomendações Atuais

O aumento generalizado do uso recreativo de trampolins pelas crianças pode parcialmente ser explicado pela necessidade recente de permanecer em casa durante períodos de confinamento impostos pela pandemia de doença do coronavírus 2019. Simultaneamente, verificou-se de uma forma global um aumento do número de acidentes pediátricos resultantes do uso domésticos destes equipamentos. As lesões resultantes podem ser graves, sobretudo nas faixas etárias mais jovens. Embora a utilização de trampolins por crianças seja amplamente desencorajada em recomendações de segurança publicadas por várias sociedades científicas e por alguns estudos recentes, existe

preocupação quanto à falta de conhecimento acerca do risco de lesões associadas ao trampolim. Este artigo de revisão visa realçar o papel único do pediatra e/ou médico de família no aconselhamento a pais e cuidadores assim como na sensibilização da população em geral para a prevenção de acidentes relacionados com trampolins envolvendo crianças.

**Palavras-Chave:** Criança; Ferimentos e Lesões/epidemiologia; Jogos e Brinquedos/lesões; Lesões Desportivas; Pré-Escolar; Prevenção de Acidentes

