

# 儿童青少年参与体感游戏的效益与风险

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**【摘要】** 为探究体感游戏(AVGs)对儿童青少年健康促进的效益与风险,本研究对国内外相关文献进行综述,详细阐述了AVGs在增加运动量和能量消耗、提高身体素质、促进心理健康、增加社交、提升认知与注意力、改善本体感觉方面的具体效益,同时也探讨了其存在的成瘾与过度使用、运动损伤以及其他风险,以期儿童青少年健康参与AVGs提供参考。

**【关键词】** 体感游戏;健康促进;儿童;青少年

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## Benefits and risks of participating in video games among children and adolescents

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**【Abstract】** To explore the benefits and risks of active video games (AVGs) for health promotion among children and adolescents, the study reviews relevant domestic and international literature and details the benefits of AVGs, including increased physical activity and energy expenditure, improved physical fitness, better mental health, enhanced social interaction, improved cognitive function and attention, and heightened body awareness. At the same time, it also addresses potential risks, such as gaming addiction and excessive use, sports-related injuries and other risks, thereby providing a theoretical reference for children and adolescents to engage in AVGs in a healthy manner.

**【Keywords】** Active video games; Health promotion; Child; Adolescent

随着生产力的提升和体育消费的数字化转型,体感游戏(active video games, AVGs)在中国已逐渐流行<sup>[1]</sup>,其通过整合互动式锻炼设备和技术,可以为参与者提供近似真实世界的游戏环境,而参与者可以在游戏中练习特定任务从而获得通关或奖励。传统被动游戏往往因长时间使用电脑、视频游戏机和移动设备产生久坐行为,而AVGs则是强调身体的活动,包含步行、奔跑、滑行、投掷、击打、跳跃、舞蹈等形式<sup>[2-3]</sup>,以促进身体活动为核心特征,有效解决了坐姿类电子游戏缺乏身体参与的弊端。AVGs利用儿童青少年对视频和计算机互动的兴趣,调动了儿童青少年的参与积极性<sup>[4]</sup>,沉浸式的游戏体验为儿童青少年提供了一种全新的运动娱乐方式。本文通过探讨AVGs的发展与作用,分析AVGs与儿童青少年健康发展之间的关联,以期充分发挥其积极作用、降低潜在风险,进而促进儿童青少年健康成长。

## 1 AVGs 概念界定、发展及应用

### 1.1 AVGs 概念界定 目前学术界对AVGs概念的界

定尚未形成共识。Wang等<sup>[5]</sup>认为AVGs是一种借助人机交互、运动感应、虚拟现实和其他高科技技术的体育娱乐游戏;Abd-Alrazaq等<sup>[6]</sup>认为AVGs是一种基于生物反馈系统,通过参与者身上的传感系统,传输肢体位置、肌肉收缩、足底压力等有关身体参数信息,从而在参与者和游戏之间建立动态互动的电子游戏;Calcaterra等<sup>[7]</sup>则认为AVGs是一种需要身体运动的数字游戏,参与者通过全身运动与游戏互动,从而增加游戏体验,以达到增加体育活动、改善能量消耗的目的。基于上述观点,可以将AVGs理解为一种能激发全身参与互动体验的电子游戏,通过协调和受控的方式与数字环境互动,从而提高身体、心理、认知水平。

1.2 AVGs 发展 AVGs出现于20世纪80年代<sup>[8]</sup>,随后得到迅速发展,类型也日渐丰富,包括舞蹈游戏、冒险游戏、角色扮演游戏等<sup>[9]</sup>。AVGs不受天气和季节的影响,可以在室内进行,也可以单独或集体进行,极大降低了运动环境的限制。目前发达国家和地区由于游戏机、智能手机、高速互联网的普及使儿童接触

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AVGs 的机会更为普遍,但经济欠发达国家和地区儿童参与 AVGs 的程度较低。此外,在相同国家不同地区、城乡以及不同经济水平区域之间也存在差异<sup>[7]</sup>。

**1.3 AVGs 应用** 在学校体育课程中,AVGs 可以作为一种对传统体育活动的补充,以增加儿童青少年身体活动量。近年来,AVGs 越来越多地运用于学校中,作为促进儿童青少年积极参与身体活动的一种创新且有趣的教学方法<sup>[10]</sup>。将 AVGs 引入中小学体育课程,可以提高学生的上课出勤率和对体育活动的热情,使学生从被动接受式的学习转变为自主的学习模式,以提高其运动成绩<sup>[11]</sup>。在健康促进方面,AVGs 能够避免儿童青少年久坐行为,提高其参与体育运动积极性,并帮助超重和肥胖儿童青少年实现更加积极和健康的生活方式,进而提高身体功能水平。

## 2 儿童青少年参与 AVGs 的潜在效益

**2.1 增加运动量和能量消耗** 近年来,儿童肥胖已经成为全球范围内日益严重的问题,对公共健康构成严重的挑战<sup>[12]</sup>。有研究表明,AVGs 能够有效降低总胆固醇水平,是一种降低体质量指数 (body mass index, BMI) 的非药物方法<sup>[13]</sup>。AVGs 不但能够改善儿童青少年的 BMI、身体成分和体脂率,还能预防与肥胖相关的慢性疾病,如高血压、糖尿病、特定癌症以及心脏问题<sup>[14]</sup>。原因是 AVGs 能够提高儿童青少年身体活动动机,增加他们在家庭或学校的身体活动量,减少久坐时间、增加能量消耗,从而减轻体重和降低 BMI<sup>[13]</sup>。相关研究指出 AVGs 能够为 9~17 岁儿童青少年带来轻度至中等强度的身体活动<sup>[15]</sup>,相当于运动中心率 (heart rate, HR)  $\geq 50\%$  HR<sub>max</sub><sup>[16]</sup>。由于男生和女生选择 AVGs 的类型不一样,男生往往比女生消耗的能量更多<sup>[17]</sup>;而在游戏类型方面,拳击类游戏能量消耗通常高出舞蹈类游戏<sup>[18]</sup>。

**2.2 提高身体素质** AVGs 可以有效提高儿童青少年的身体素质<sup>[19]</sup>,发展力量、耐力、跳跃、躲闪、反应速度、协调性和特定运动技能<sup>[3,20]</sup>。有研究指出,11~14 岁的儿童接受每周 3 d、每次 18 min,为期 8 周的 AVGs 练习后,其在 20 级台阶、120 s 完成深蹲次数、50 m 跑、30 s 跳绳次数等方面均有所提高<sup>[21]</sup>;而每周 3 次、每次 30 min,持续 18 周的 AVGs 练习能够显著提升六年级学生的心肺耐力<sup>[22]</sup>。另有研究显示,相较于商业化 AVGs,专为提升儿童基础运动技能的 AVGs 采用系统化的技能习得方法,如评估、规则、挑战、反馈与指导,能提高 5~6 岁儿童的基础运动技能水平<sup>[23]</sup>。

**2.3 促进心理健康** 良好的心理健康和稳定的情绪能够促进儿童良好的社会关系并为学习创造有利条件<sup>[24]</sup>。有研究表明,AVGs 能够对儿童青少年心理健

康产生积极影响,可以使其保持快乐和改善情绪状态<sup>[25]</sup>、减少抑郁等负面情绪<sup>[21]</sup>。一项综述研究指出,6~19 岁的儿童青少年每周参与 AVGs 1~3 次、每次 10~90 min,能够提高自尊、自我效能感并促进心理健康<sup>[26]</sup>。可能是因为参与者在 AVGs 中能够有效释放内啡肽、多巴胺、血清素和催产素,以上物质能够促进神经系统反应,放大参与者的愉悦感,从而减少抑郁症状的发生,进而改善心理健康状况<sup>[27]</sup>。

**2.4 增加社交** 社交行为涉及个体间的互动,如沟通交流、交谈时与人眼神接触、微笑以及攻击性行为,进而塑造个体与他人关系的发展。AVGs 能够在计算机媒介环境中提供促进社交互动的空间<sup>[28]</sup>。既往研究表明,体验社交临场感、建立社交联系<sup>[29]</sup>、获取社交效益<sup>[30]</sup>以及获得社交归属感<sup>[31]</sup>是人们参与 AVGs 的主要动机,且团体玩家参与 AVGs 的时间高于单独参与游戏者<sup>[32]</sup>。而参与 AVGs 的时长与 3~19 岁儿童青少年的社交行为改善呈正相关,为期 4~36 周的干预效果明显高于 3~4 周的短期干预效果<sup>[31]</sup>。

**2.5 提升认知与注意力** 由于 AVGs 同时刺激身体和思维,因此 AVGs 可能促进认知的发展<sup>[33]</sup>。现有研究主要关注认知中的执行功能,而执行功能是促进目标导向行为的认知过程,即在存在竞争性无关刺激的情况下,仍能执行与目标相关的反应能力<sup>[34]</sup>。研究发现,在 AVGs 中需要参与者抑制和发起行动、集中注意力、处理感觉信息、计划、决策以及快速准确地反应<sup>[2]</sup>。因此,AVGs 能够预防和改善认知障碍,同时认知参与特性可以培养执行功能<sup>[35]</sup>。

注意力是从周围环境中大量感觉信息并选择最相关刺激的能力,AVGs 能够增加脑电图中 P2 波幅,参与者的注意力控制过程可以得到改善<sup>[36]</sup>。注意力控制包括执行功能机制,如抑制、转换和工作记忆<sup>[37]</sup>,与奖赏系统具有协同作用,可以减弱对目标无关信息的处理<sup>[38]</sup>,从而促成儿童青少年更有效的处理和学习的。有研究指出 AVGs 可以对儿童的抑制控制、工作记忆产生积极影响<sup>[39]</sup>,同时可以增强视觉注意力及语言处理能力,从而提高阅读效率<sup>[40-41]</sup>。此外,AVGs 还可以培养 8~12 岁参与者的空间感知能力及对因果关系的理解,促使参与者积极响应视觉反馈、规划行动、理解空间限制,并构建与游戏互动相关的身体动作认知体系,且在 6 个月的随访中依然持续保持这种能力<sup>[42]</sup>。在听觉注意力方面,AVGs 可以促进感官信息随时间积累的速率而增加,从而增强听觉中排除噪声机制的效率<sup>[43]</sup>。

**2.6 改善本体感觉** 非典型性发育儿童常常伴有不同程度的大脑损伤或中枢神经系统障碍,表现为发育迟缓、平衡和运动技能缺陷<sup>[44]</sup>、粗大及精细动作发育

落后于正常发育的同龄人<sup>[45]</sup>。AVGs 可以增加本体感觉的输入,提高下肢运动的控制能力、平衡能力和协调能力,并显著改善 3~18 岁非典型性发育儿童青少年的位移技能、维持或扩大关节活动范围、缓解下肢痉挛症状、改善踝关节的灵活性和稳定性,提高行走的稳定性和速度<sup>[46]</sup>。

### 3 儿童青少年参与 AVGs 风险

**3.1 成瘾与过度使用** 与传统身体活动相比,AVGs 能够通过虚拟奖励和人机交互增加参与者愉悦感和成就感<sup>[47]</sup>,而愉悦感和成就是儿童参与身体活动的内在动机<sup>[48]</sup>。儿童青少年在 AVGs 中能够个性化设置和适应性调整,在沉浸式的体验中可增强放松效果;同时,游戏的特征和动画效果也可增加儿童青少年在游戏中的动机并提高参与度。参与者认为 AVGs 比传统体育活动更有趣、更充满活力、视觉吸引力更强、互动性更强<sup>[49]</sup>。因此,AVGs 比传统体育活动具有更大的依从性。有研究指出,6~12 岁的男生参与者倾向于射击、动作、赛车、冒险和角色扮演类的 AVGs,而相同年龄段的女生参与者则更倾向于模拟游戏和解谜游戏<sup>[50]</sup>,且男生更容易对 AVGs 形成依赖<sup>[51]</sup>。此外,AVGs 的成瘾性还受到参与人数和社会文化背景等因素影响而存在差异<sup>[52]</sup>。

**3.2 运动损伤** 有研究表明,AVGs 有别于传统电子游戏和传统体育运动,玩法不受体力、耐力及训练水平的限制,提供的愉悦感使参与者感知疲劳程度低于常规运动<sup>[53-54]</sup>。但参与 AVGs 时,由于重复动作的频率越高、持续时间越长,参与者越容易发生损伤,包括急性和过度疲劳损伤,如急性肌肉损伤、上肢过度使用综合征以及延迟性肌肉酸痛<sup>[55]</sup>。损伤多与 AVGs 类型、运动形式有关。手持设备类如棒球、网球、保龄球等 AVGs 易发生上肢急性肌肉疼痛、冈下肌急性肌腱炎、上肢骨骺炎、手腕肌腱炎等损伤,而拇指操作类则易引发长拇指伸肌肌腱炎,使用跳舞毯和平衡板则会引发跟腱肌腱炎、髌腱肌腱炎和下肢骨骺炎<sup>[56]</sup>。

**3.3 其他风险** AVGs 还会对儿童青少年造成其他不利影响,主要表现为网络欺凌、攻击性行为、视力问题和睡眠问题。一项针对 13~17 岁青少年的研究显示,在线 AVGs 为参与者提供了社交互动,同时也增加了青少年与陌生人的互动,从而增加了网络欺凌发生率,而暴力 AVGs 则会引发参与者的攻击性行为<sup>[57]</sup>。在视觉方面,有研究显示参与者在 AVGs 中,双眼需要聚焦于虚拟物体的感知深度,同时还要适应物理屏幕的固定距离;这种不匹配会破坏眼睛在这两个过程中的自然协同,连续参与 AVGs 2 h 以上,引发计算机视觉综合征的风险会显著升高<sup>[58]</sup>。在睡眠方面,有学者

认为儿童青少年在睡前使用电子游戏设备会增加入睡潜伏期、减少主观嗜睡,可能与设备屏幕发射的蓝光抑制褪黑激素的分泌有关<sup>[59-60]</sup>。

### 4 小结与展望

儿童青少年参与 AVGs 虽有一定功效,但功效并不等同于户外体育运动,毕竟 AVGs 运动强度低,且存在成瘾、过度使用、运动损伤等潜在风险。因此,儿童青少年参与 AVGs 时应将单次时长控制在 2 h 以内,并避免睡前参与游戏。家长、教师与游戏平台应协同发力,强化对儿童青少年的保护与监督。此外,在兼顾儿童青少年兴趣的同时,注意 AVGs 类型的选择和交替参与,避免长时间沉浸于单一类型的游戏中,从而最大限度发挥 AVGs 的积极效益并避免其潜在风险。

现有研究成果还存在不足,未来研究需要更深入的探索:(1)增加研究的样本量,确保研究结果的可靠性;(2)探究不同强度和长期参与 AVGs 对儿童青少年的影响;(3)分析不同年龄段、不同类型 AVGs 对儿童青少年的效益与风险;(4)增强“AVGs+户外运动”融合力度,提升儿童青少年体质健康水平;(5)对 AVGs 诱发风险的机制研究不足,未来可展开深入研究。

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