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城市环境对积极交通出行的影响
——中西方研究比较

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摘要: 本文总结和比较了中西方的积极交通研究，基于对中西方积极交通发展趋势的总结，发现各国积极交通发展大都经历了“繁荣-衰落-复兴”3 个阶段。这一过程与各国城市化和机动化发展进程紧密相关。通过梳理中英文期刊中有关城市环境影响积极交通出行的文献，总结一般性的规律。再从城市环境对积极交通出行的影响效果以及人口经济特征的调节效应等方面，比较中西方研究在研究结论和侧重点上的差异。最后，为相关领域的研究工作提出展望，以期为国内开展进一步的研究提供指导。

关键词: 积极交通出行; 建成环境; 社会环境; 环境干预

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以步行和自行车出行为代表的积极交通不仅是一种低碳可持续的出行模式[1]，同时也对居民身心健康具有积极的影响[2-3]。随着中国城市化逐渐进入低速与高质量发展的转型阶段，积极交通在减少交通系统碳排放，促进城市可持续发展，提升居民幸福感等方面发挥着重要的作用。

在促进积极交通出行过程中，环境干预措施发挥了重要的作用。来自城市规划方面的手段能够营造良好的出行环境，提升居民积极交通出行的频率和比重。然而，在制定干预策略之时，有一些问题需要明确。什么样的城市环境对积极交通出行存在影响？这种影响在不同的区域背景下是否存在差异？鉴于不同国家和地区的城市化和机动化进程以及积极交通的使用强度等方面存在较大的差异，城市环境对积极交通出行的影响效果也不完全一致。在北美和澳大利亚，步行和骑自行车经常被认为是健身活动，只占日常出行模式的边际份额。然而，在中国和小部分欧洲国家（例如丹麦、荷兰和瑞典），积极交通在出行模式中占比较大。因此，对于中国而言，西方发达国家经验的可转移性或可推广性值得怀疑。有鉴于此，本文通过综述英文期刊中有关城市环境影响积极交通出行的相关文献①，系统总结城市环境对积极交通出行的影响，并讨论不同区域背景下的异质性。基于文献综述，本文将为中国有关积极交通的实证研究和规划实践提供相关知识和启示。

1　城市化、机动化与全球积极交通发展趋势

从全球来看，积极交通发展大致呈现“繁荣-衰落-复兴”3 个阶段（图 1）。城市化和机动化发展是导致“繁荣”到“衰落”的主要因素。在北美和澳大利亚，以低密度和单一土地利用为主要特征的城市蔓延增加了通勤距离，加剧了居民对私家车的依赖，降低了积极交通模式在日常出行中的地位[4]。在欧

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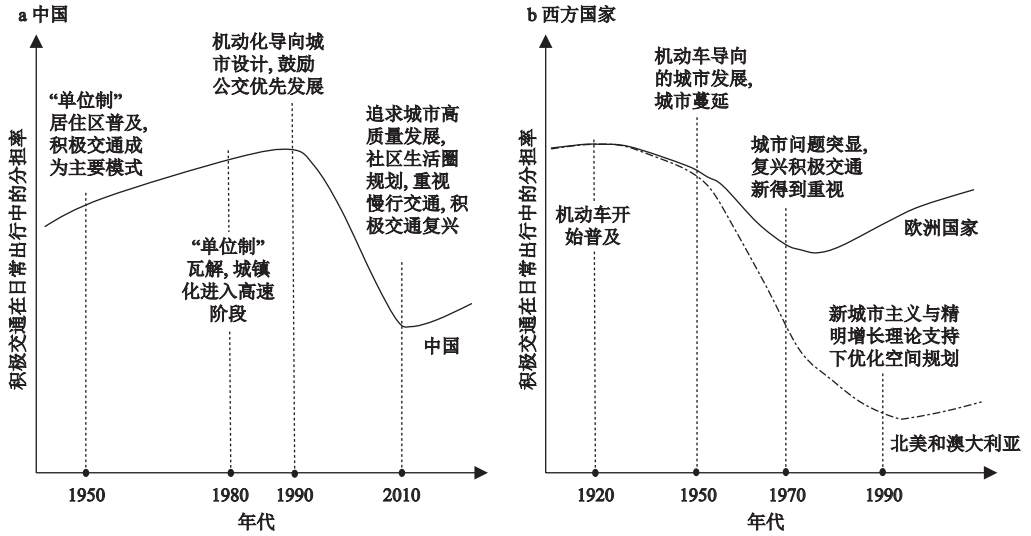
① 本文建成环境与积极交通出行相关的英文文献检索于 Web of Science（webofknowledge.com）核心合集，使用“Active travel”“Active transport”“Walking”“Cycling”“Neighborhood environment”“Built environment”以及“Social environment”等主题词（及其组合）进行检索，筛选相关的文献。考虑本文篇幅限制，对于结论相似的文献，笔者仅将部分发表于主流期刊、且引用量较高的代表性文献纳入本文综述内容。



图中曲线仅表示积极交通出行率的变化趋势, 并不反映具体的数值

图 1　中国和西方国家积极交通的发展趋势

Fig.1　Trends of active travel in China and the western countries

洲, 人口郊区化和活动的分散导致出行时间越来越长[5], 使得各国自行车使用比例大幅下滑[6]。在中国, 自从 1995 年自行车保有量达到历史高峰之后[7], 许多城市采取了鼓励机动化和公共交通, 限制自行车发展的相关举措[8]。此外, 城市扩张和职住分离增加了居民日常出行的距离[9]。在此背景下, 常规自行车拥有量迅速下降, 在 1995—2001 年期间减少了约 33%, 自行车出行占比锐减, 机动化出行占据主导[7]。

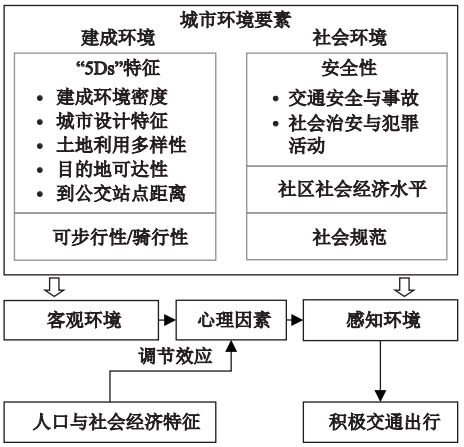
为了应对城市化和机动化所带来的问题, 各国政府和学者们提出了一系列规划理念和干预策略。这些理念和策略为积极交通的发展创造了良好的环境, 促进了积极交通的“复兴”。在北美和澳大利亚, 新城市主义[10] 和“精明增长”[11] 理念影响下的城市和社区规划更加强调促进城市紧凑发展和土地混合利用, 并创建支持步行和骑行的社区[12-13]。在欧洲, 通过大规模建设自行车骑行与存放的相关基础设施, 强化积极交通出行与公共交通的整合, 推广公共自行车系统等举措, 各国积极交通出行里程和比重有所提升[14]。在中国, 支持慢行交通发展的相关政策以及社区层面“生活圈”规划等干预手段构建了可步行/可骑行的城市环境[15], 一定程度上提升了积极交通出行比例。与此同时, 新冠肺炎全球大流行也为复兴积极交通带来了机遇。受疫情期间公共交通供给锐减以及保持社交距离等因素的影响, 积极交通(尤其是自行车)出行受到青睐[16], 成为疫情期间人们出行的首选模式之一[17]。在一项全球横断面研究中, 骑自行车者的比例从 8% 增加到 26%[18]。一些研究预计, 在后疫情时代, 积极交通的热度仍会持续[19-20]。

2　城市环境对积极交通出行的影响

本文所关注的积极交通出行特指以步行和自行车为主的, 有明确出行目的的出行模式(包含通勤、上学、购物等功利性出行), 不包含无明确目的的出行(例如步行或骑行锻炼)。一般而言, 城市环境包括物理环境(包括自然环境和人工改造的建成环境)和社会环境(例如社会规范与社区凝聚力等)[21-23]。地理、规划和交通行为领域的研究通常关注建成环境和社会环境对出行行为的影响。此外, 从测量方式来看, 城市环境可以划分为客观环境和主观(感知)环境[24]。与客观环境不同, 感知环境依赖于个体在生活的邻里环境中发展起来的认知结构与表征, 因此, 两者有时存在差异[24]。在此基础上, 本文构建了城市环境影响积极交通出行的理论框架(图 2), 并分别阐述建成环境、社会环境以及感知环境的一般影响。

2.1　建成环境

建成环境往往被概念化为 5 个维度特征(“5Ds”): 密度(density)、设计(design)、多样性(diversity)、目的地可达性(destination accessibility)以



“5Ds”为密度(density)、设计(design)、多样性(diversity)、目的地可达性(destination accessibility)以及到公交站点距离(distance to transit)

图 2 城市环境影响积极交通出行的主要路径框架

Fig.2 Conceptual relationships between the urban environment and active travel

及到公交站点距离(distance to transit)[25]。此外，一些研究也使用综合可步行/骑行性(walkability/bikeability)来描述建成环境[26]。这一指标强调社区密度、土地利用混合度以及(街道)网络可进入性 3 种城市环境特征的组合[27]。

现有研究表明：①建成环境密度与积极交通出行通常正相关[28]。这是因为高密度的城市环境通常具有良好的邻里可达性，从而支持人们在邻里内骑行或行走，减少了对机动车的依赖[29]。②城市设计方面，良好的街道连通性提升了城市的渗透性，缩短了到达目的地的距离，从而鼓励积极交通出行[30-31]；但道路交叉口密度越大也意味着街区越小，这有可能增加穿越路口的交通风险[32-33]。专用的积极交通设施(自行车道、步道以及绿道等)[34-36] 以及良好的街道美感[37] 也能够促进积极交通出行。绿色开放空间能够增加休闲为目的步行或骑行[38]，但也可能给积极通学或通勤带来阻碍[33, 39]。③多样性方面，功能混合的土地利用模式有助于缩短日常出行的距离，从而降低私家车拥有率并提高积极交通出行[40]。④目的地可达性方面，到工作场所(或其他目的地)的距离与积极交通出行通常负相关[31,41]。这是因为积极交通出行具有较短的距离阈值，当超过这个阈值时，积极交通出行成本会大幅增加，而机动化交通会更有优势[42]。⑤公交站点可达性(和服务密度)可能会促进[43] 或抑制[44] 积极交通出行。这种差异取决于公共交通与积极交通出行之间是互补还是替代关系[45]。⑥可步行性/可骑行性指数与积极交通出行通常正相关[27,46]。一方面，与汽车导向的开发模式相比，可步行的社区通常具有紧凑的土地使用模式，可提供多样化、高可达和具有吸引力的日常出行目的地，公共开放空间(公园、绿地和广场等)以及支持步行和自行车骑行的交通基础设施。这些设施使得将积极交通出行融入日常生活以达到功利性和休闲性目的变得更加容易。另一方面，高可步行的社区环境能够促进社会互动并增强社区凝聚力，从而进一步促进积极交通出行[47]。

2.2 社会环境

安全的出行环境(面临更少的犯罪威胁和交通安全风险)有助于促进积极交通出行[48-49]。与采用私家车和公共交通出行的人群相比，积极交通出行的群体充分暴露于沿线的环境之中，因此更倾向于避开他们认为危险的区域[50]。社区社会经济发展水平也与积极交通出行，尤其是自行车的使用相关，但这一关系是模糊的。一些研究表明，高社会经济发展水平的社区积极交通(尤其是自行车)出行的可能性更高，尤其是在西方发达国家[51-53]。这是因为自行车骑行(尤其是以运动和休闲娱乐为目的)在中高收入群体中更加常见[51]，并且高社会经济发展水平社区往往具有良好的积极交通出行环境和出行文化[54-55]。然而，另一些研究发现低收入社区居民倾向于使用积极交通出行，因为积极交通弥补了缺乏私家车所带来的机动性不足[56-57]。此外，社会规范，包括身边人群对积极交通出行的(支持性或反对性)态度以及自行车文化等，也会影响积极交通出行[58-60]。

2.3 感知环境

感知环境在客观环境影响积极交通出行过程中发挥中介作用和调节作用。一方面，根据环境心理学的“刺激-机体-反应(Stimuli-Organism-Response, SOR)”模型[61]，客观环境通常影响主观环境感知，进而影响出行行为[62]。例如，公共空间质量对积极交通的正面影响可以通过感知的街道美感和公共空间愉悦性发挥作用[63]。另一方面，不同人群对客观环境的感知存在差异[64]，从而调节了客观环境对积极交通出行的影响[65]。例如，由于不同性别的人群对于环境的体验不同，一些环境特征(例如自行车设施)可能鼓励男性更频繁地使用自行车出行但并不足以给女性带来愉快的体验[66]。在积极交通出行过程中，居民对可步行/可骑行环境的积极态度在一定程度上缓和了对积极交通出行不太友好的建

成环境的负面影响[67]。这意味着提高居民对积极交通友好型环境属性的认知有利于促进积极交通出行。

3　中西方城市环境对积极交通出行影响的差异分析

中西方城市在机动化水平、城市环境以及文化背景等方面存在较大的差异[68]。这不仅影响城市环境对积极交通出行的效应，也导致中西方研究的侧重点有所不同。基于对文献的分析，本文从建成环境的影响、社会环境的影响、人口和社会经济特征的调节效应、环境干预效果 4 个方面比较中西方研究结论的差异。

3.1　建成环境

1)建成环境密度。在北美和澳大利亚蔓延式的城市土地开发背景下，大多数研究发现高密度建成环境(包括人口、就业、住宅和活动点密度等)有助于促进积极交通出行[69-73]。然而，在中国和欧洲紧凑式的城市土地开发下，尽管有些研究证实了它们之间的正相关关系[31,74]，但更多的证据表明密度与积极交通出行无关[22,75]，甚至呈现负相关[76] 和非线性的关系[29]。中国城市建成环境密度高，且呈现出空间紧凑和多核心的特征[68,77-78]。在欧洲，尽管城市人口密度逐渐下降，但城市形态依然保持紧凑型的特征[79-80]。这些特征保障积极交通出行范围内的良好可达性。此外，虽然一定高密度的建成环境有助于促进积极交通出行，但过高的密度可能对积极交通出行带来负面影响。一方面，极端的高密度可能会限制生活空间的流动性，并增加居民在交通拥挤、噪音和污浊环境中的暴露，从而抑制积极交通出行[29]；另一方面，高密度的建成环境往往拥有更多的交通模式(例如公交和地铁)可供选择，从而降低了积极交通出行的可能性[76,81]。因此，建成环境密度可能与积极交通出行呈现倒 U 型关系，这在中国的几项研究中得到了证实[82-84]。

2)可步行性/骑行性与土地利用多样性。很多北美和澳大利亚的案例研究支持可步行性和土地混合利用与积极交通出行的正相关性[46,69]。在北美和澳大利亚，私家车的高拥有量导致以机动车为导向的城市土地开发模式，城市蔓延、单一功能的用地开发以及城市中心的衰落成为一种普遍的现象[68,85-86]。这种依赖私家车的城市环境不利于积极交通的发展。在“新城市主义”“精明增长”和“紧凑城市”等规划理念的影响之下，城市和社区规划更加强调高强度的土地开发、混合的土地利用以及适宜步行的邻里环境[13,87-88]。新的城市和社区规划策略为积极交通出行创造了支持性的城市环境，并在一定程度上提升了步行和自行车出行份额。在欧洲，由于不同国家在机动化、积极交通流行率以及城市环境等方面存在差异，可步行性和土地利用混合度对积极交通出行的影响亦不同。在法国和英国等积极交通出行率较低的国家，可步行性和土地的混合利用依然是促进积极交通出行的重要指标[65,89]。在荷兰，土地利用混合度对自行车出行的影响通常并不显著[90-91]。在中国，无论是在计划经济时代还是市场经济时代，城市和社区规划往往强调功能的混合，这也导致中国城市具有高功能混合度的城市特征[92-95]。因此，大量有关中国城市的案例研究发现混合的土地利用与积极交通出行(尤其是自行车出行)的关系并不显著[22,75,95]。

3)城市设计特征。西方关于城市设计和积极交通的研究集中在道路设计上。在北美和澳大利亚城市，道路连通性通常与积极交通出行正相关[69,96-97]，但在中国和欧洲城市则呈现更复杂的关系。在北美和澳大利亚城市郊区，道路网络的曲线和死胡同设计降低了道路连通性[98]。因此，随着道路连通性的增加，居民不仅获得更好的步行可达性，而且能够更灵活地选择积极交通出行的路线。然而，在中国和欧洲，道路连通性对积极交通出行的影响可能并不显著[45,91-99]。高密度、小尺度的街区单元往往伴随着较高的街道网络渗透性。随着道路连通性的进一步提升，街区的破碎化反而会增加穿越道路的交通风险并制约骑行的连续性，从而给积极交通出行带来负面影响[32,75,100]。

4)目的地可达性。这项特征的差异主要体现在到市中心和商业中心的距离上。在西方国家的研究案例中，到市中心和商业中心的距离通常与积极交通出行负相关[41,101]。在西方国家，尤其是北美和澳大利亚，市中心拥有高的密度和土地利用混合度，而郊区往往因为密度过低和土地利用模式单一而不利于积极交通出行。在中国，靠近市中心和商业中心可能与积极交通出行弱相关[22,74]。在中国高密度开发和商住用地混合的背景下，相对成熟的城市边缘地区往往也拥有良好的邻里可达性，能够支持积极交通出行。因此，郊区的可步行环境和日常商业设施对促进积极交通出行至关重要[67]。

5)到公交站点距离。在公交可达性方面，目前没有足够的证据证实中西方研究结论存在显著的差异。在西方国家，公交可达性和公交服务是促进积极交通出行的重要变量[43,65]。在荷兰、丹麦、挪威和德国等自行车出行比例较高的国家，整合公共交通和自行车出行是一项重要的工作[14,102]。在此背景下，西方国家大量的研究关注了公共交通枢纽周边的积极交通出行环境[103-106]。在中国，除少量研究关注了南京和深圳地铁与积极交通的换乘环境之外[45,107]，相关结论较少，无法支持与西方国家的对比。

3.2 社会环境

社会环境对积极交通出行影响的差异主要体现在安全性上。在北美和澳大利亚，交通安全和犯罪对积极交通出行(尤其是儿童积极通学)的影响受到了广泛的关注，且大部分研究证实了安全的环境促进积极交通出行[48,52,108-109]。在中国和欧洲，安全性(尤其是犯罪威胁)对积极交通出行的影响很少被关注。在荷兰的一项研究中，父母感知的交通和犯罪威胁甚至与儿童采用积极交通模式上学无关[110]。这可能与中国和欧洲城市的建成环境特征(例如较高的建成区密度、混合的土地利用模式、良好的设施和服务可达性)以及良好的治安有关。尽管一些研究发现土地混合利用、良好的设施和服务可达性以及较高的建成环境密度可能会导致特定犯罪活动的增加(例如更多的商业活动导致抢劫和袭击活动的增长)[111-112]，但更多的研究证实这些环境特征不仅能够降低总体的犯罪发生率(例如，通过犯罪活动的监视效应)[111,113-114]，同时也能提升居民感知的安全感[115]。

3.3 人口和社会经济特征的调节效应

在西方国家，个体的人口和社会经济特征通常是城市环境影响积极交通出行的重要调节因素，而国内的研究证据相对缺乏。在北美，女性更加注重于周边环境。公交可用性，安全的自行车道，建筑密度以及到日常目的地的距离等环境特征与女性的积极交通出行行为更相关[116]。这是因为与男性相比，女性对周边环境的主观评价以及对安全性的感知与她们的积极交通出行动机的相关性更强[117]。出行环境中的交通安全与犯罪威胁是影响女性积极交通出行(尤其是骑行)的重要因素[118-121]，但对于男性的影响相对较小[122]。然而，在欧洲高积极交通出行率的国家，性别差异并不显著。在美国日常骑行超过 30 min 的人群中，男性比重(1.5%)远高于女性(0.4%)，而同期德国的性别差距微弱(男性和女性人群比重分别为 8.5% 和 7.0%)[123]。

无论在北美、澳大利亚还是欧洲，弱势群体(包括低收入者、少数族裔等)都是重要的研究对象。一般而言，弱势群体的积极交通出行与城市环境的关联更弱[72,124-126]。这是因为他们往往缺乏私家车和机动性，且更多地生活在非支持性(积极交通)的城市环境之中，因此积极交通出行不太容易受到环境的干扰[124-125]。然而，中国的案例研究有限。尽管 Ma 等[127] 发现社会规范、环境美感、自行车基础设施和地铁站的便利性对低收入社区居民自行车出行有显著影响，但并没有证据支持不同城市环境对不同群体积极交通出行影响存在异质性。

在不同国家和区域，城市环境对积极交通出行影响在群体间的异质性部分源于社会环境(如限制妇女骑行的文化氛围)和建成环境(如安全的基础设施)方面的差异[128]。尽管国内缺乏关于群体异质性的讨论，这可能归结于研究视角的局限，并不意味着中国不存在交通公平和社会排斥等社会问题。

3.4 环境干预效果

从城市环境的影响程度和环境干预的效果来看，没有足够证据表明中国和西方国家存在差异。由于不同的实证研究案例纳入的特征类型和范围有所差别，很难严格地通过对比回归模型的弹性系数来评估单个特征的影响程度是否存在地区差异。在所有环境特征的组合效应方面，机器学习可以计算出城市环境在预测因变量上的贡献率，从而提供跨区域比较的手段[83]。有限的研究表明，在美国，建成环境对预测明尼苏达州双城地区居民积极交通出行的贡献率为 68.8%[129]。在中国，建成环境对预测工作和购物积极交通出行(厦门)以及老年人步行(南京)的贡献率分别为 27.0%、35.4% 以及 68.0%[83-84]。然而，由于机器学习的案例研究数量有限，目前没有足够证据证实城市环境的组合效应是否存在区域异质性。

机动化和积极交通出行率也会影响环境干预策略的效果。在美国依赖私家车出行的背景下，为促进积极交通出行而采取的环境干预策略效果有限[130]。在英国，环境干预同样被视作效果有限的手段[51]。这些研究似乎支持了一种观点，即在积极交通出行率较低的国家和地区，城市环境对积极交通出行的影响程度有限。然而，对于积极交通出行率较高的国家，例如荷兰、丹麦和中国等，目前并没有

直接的证据表明环境干预的效果是否优于北美和澳大利亚。一种假设是，由于采用积极交通出行的人口基数存在差异，在积极交通出行比例较低的国家，包括北美、澳大利亚和欧洲部分国家（例如英国和法国），即便城市环境对积极交通出行影响的弹性系数和干预效果相同，最终的受益人数也会少于积极交通出行比例较高的国家（例如荷兰、丹麦、德国以及中国）。

4　讨论与展望

从全球来看，积极交通出行经历了“繁荣-衰落-复兴”3 个发展阶段，这种变化与城市化和机动化所带来的城市环境变化密不可分。规划学者通常认为通过城市规划的手段营造良好的积极交通出行环境，对于促进居民积极交通出行至关重要。国际上大量的研究已经识别出一些积极交通出行的支持性环境特征，包括一定的高密度、混合的土地利用模式、良好的街道连通性、步行和自行车骑行的支持性设施、安全出行环境以及支持性的社会文化等。在城市环境影响积极交通出行过程中，环境感知发挥中介和调节作用。

然而，中国和西方国家有关城市环境影响积极交通出行的研究结论和研究侧重点有所不同。这些差异体现在密度、土地利用混合度、可步行性、道路设计、到市中心和商业中心距离以及环境的安全性等方面。西方国家的研究重视不同（人口和社会经济特征）人群中环境影响出行的异质性，而国内缺少相关的研究。这些差异表明针对中国城市的研究和政策需要体现中国城市化发展的独特背景，并重视挖掘中国特色的原创知识和理论。未来的研究可以从以下几个方面进一步深化：

第一，更多地关注城市环境与积极交通出行之间的因果关系和非线性关系。现有的基于截面数据的研究不能有效排除其他因素的干扰，例如居住自选择效应[131-132]。因此未来应该更多地开展干预研究（或纵向研究）来证实城市环境的变化（或采取的环境干预措施）对积极交通的影响，从而增强因果推断而不是重复相关性研究。此外，现有关于城市环境影响积极交通出行的研究通常基于（广义）线性假设。然而，越来越多的研究发现城市环境对积极交通出行的影响存在阈值效应（非线性关系）。鉴于中国区域差异显著，不同规模城市的发展背景也存在差异，因此未来的研究需要更多地考虑阈值效应，从而在不同环境背景下提出针对性的干预策略。

第二，聚焦中国背景下的研究主题，提出具有中国特色的创新理论和实践指南。中国和西方国家的城市化和机动化特征有所不同，面临的问题和解决的方向也会有差异。结合中国城市和交通发展的独特背景，未来可以进一步探索以下的研究主题。① 与西方国家较高的小汽车普及率不同的是，摩托车和电动自行车在中国机动化过程中扮演着重要的角色。这一特征是否会对环境干预的效果带来影响？此外，电动自行车还是传统自行车更适合中国城市的背景？城市规划和城市设计如何能更好地兼容步行、传统自行车以及电动自行车等多种低碳交通模式？这些问题都与中国城市独特的机动化特征有关。② 尽管中国城市高密度开发和混合的土地利用为积极交通出行创造了条件，但封闭的社区也在一定程度上限制了居民出行的路线选择。在中国城市开展“15 分钟社区生活圈”建设的过程中，需要更多地探讨和应对封闭社区对积极交通出行带来的阻碍。③ 在中国大城市居民普遍面临长距离通勤的背景下，单一的积极交通出行模式很难满足远距离的出行需求。此外，随着城市群和都市圈成为中国城市化过程中的主要形态，城际出行也愈加频繁。将积极交通与其他城市交通（例如公交和地铁）和区域交通（例如高速铁路）整合至关重要。因此，未来的研究需要进一步考虑多式联运背景下支持积极交通的环境干预策略。

第三，对积极交通出行行为进行更精确的模式划分和测度。现有的研究对积极交通出行的定义是不清晰的。一些研究仅关注单一的步行或自行车出行，而一些研究则将两种模式合并考虑。此外，在实证研究中，是否采用积极交通出行、出行频率和出行持续时间等都可以被作为因变量。考虑到文献筛选的工作量，本文并没有严格区分这些模式类型和测度方式。然而，一些研究强调，支持步行和骑行的环境可能存在差别[22,99]，而因变量的测度方式也会对结果带来影响[51]。因此，未来的研究和政策干预需要更多地关注和区分出行模式和测度方式，并关注这些差异是否会对环境干预的效果带来影响。

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Connections between the urban environment and active travel: Comparing studies on China and the western countries

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Abstract: Over the last three decades, a growing number of studies have examined the impact of the urban environment on active travel, aiming to identify effective environmental interventions to promote active transportation. However, given the disparity in the levels of urbanization and motorization between China and the western countries, empirical evidence from the western countries may not be generalizable to China. Through analyzing and comparing relevant research from China and the western countries, this study aims to provide new insights into future research on active travel in China. First, we found that the development of active transportation in most countries has generally followed a "boom-decline-revival" pattern, which is closely correlated with the levels of urbanization and motorization in the corresponding countries. Second, we reviewed the literature on the relationship between the urban environment and active travel, and identified several general patterns linking the urban environment and active travel. We found that a high-density built environment, mixed land use patterns, good street connectivity, supportive facilities for walking and cycling, a safe travel environment, and a supportive social culture promote active travel. Moreover, environmental perceptions play a mediating and moderating role in the process of the urban environment influencing active transport travel. Third, we summarized key differences in research findings between studies from China and the western countries. Our analysis revealed that some urban environmental elements, including built environment density, land use diversity, walkability/bikeability, road design, distance to city centers or commercial centers, and environmental safety, have different effects on active travel of urban residents in China and the western countries. Furthermore, studies in the western countries have focused on the moderating effect of individual characteristics in the process of urban environment influencing active travel, empirical but evidence is lacking in China. Finally, we made recommendations for future research. We suggested that future research should explore more the causal and non-linear relationships between the built environment and active transport travel, as well as precise modeling and measurement of active transport travel behavior. More importantly, future research should focus on unique issues related to urbanization and motorization in China, and propose unique and innovative theories and practical guidelines.

Key words: active travel; built environment; social environment; environmental intervention