ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Cycling commuting as emotional self-regulation – A qualitative study based on self-determination theory

Michał Nowakowski[1,A-F], **Luiza Nowakowska**[2,C-F]

[1] *Institute of Sociology, Faculty of Philosophy and Sociology, Maria Curie Skłodowska University, Lublin, Poland*
[2] *Department of Humanities and Social Medicine, Faculty of Medical Sciences, Medical University, Lublin, Poland*
A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of the article

Nowakowski M, Nowakowska L. Cycling commuting as emotional self-regulation – A qualitative study based on self-determination theory. Ann Agric Environ Med. doi:10.26444/aaem/213793

Abstract

Introduction and objective. Cycling commuting (CC) is increasingly recognized not only for its environmental and health benefits, but also for its psychological value. Preliminary research findings suggest that CC is often experienced as a form of relaxation. This led the exploration of CC as a potential form of emotional self-regulation (ESR), using Self-Determination Theory (SDT) and the concept of psychological commute characteristics (PCC) as explanatory frameworks.

Materials and Method. A qualitative study was conducted in Lublin, Poland, using abductive thematic analysis of 32 semi-structured interviews collected in 2020–2024. PCC dimensions and ESR strategies were operationalized and linked to inductively coded features of commuting practice. The analytical chain followed the logic: PCC → SDT need satisfaction → ESR.

Results. All five ESR strategy families were present in cyclists' narratives, with situation selection and situation modification most frequent. PCC features, such as decision latitude, psychological stimulation and physical aspects, supported autonomy and competence, while relatedness played a minor role. ESR strategies helped participants manage stressors and enhance positive emotions, explaining why CC is perceived as enjoyable and motivating.

Conclusions. Cycling commuting can be reframed as a psychological practice that supports emotional regulation through everyday strategies. By integrating PCC, SDT, and ESR, the study offers a novel interpretive framework for understanding the psychological benefits of CC and provides insights for urban mobility policy and infrastructure design.

Key words

self-determination theory, emotional self-regulation, cycling commuting, psychological commute characteristics

INTRODUCTION

Cycling commuting (CC) reduces air pollution [1], CO_2 emissions [2], noise, traffic, parking space shortages, and health issues linked to physical inactivity [3, 4]. It also supports mental well-being [5, 6] and lowers the risk of mental disorders [7, 8]. Qualitative studies show car commutes are most stressful, public transport delays add boredom, walking is most relaxing, while cycling blends calm and stimulation, making it most rewarding [9]. Positive evaluations of CC seems to be related to greater control over the commute, opportunities for social interaction, improved physical fitness, and pleasant sensory stimulation [10]. Commuting satisfaction is highest among cyclists, and switching from car or public transport to cycling enhances psychological well-being [5, 6, 10, 11].

To explain why CC may enable ESR, we refer to psychological commute characteristics (PCC) [12]: decision latitude (DL), psychological stimulation (PS), social characteristics (SC), physical aspects (PA), and insecurity (IN). According to Gerpott et al. [12], these characteristics shape the conditions for satisfying basic psychological needs: autonomy (AUT), competence (COM), and relatedness (REL). Drawing on the Self-Determination Theory (SDT) [13], they argue that need satisfaction determines whether self-regulation is autonomous or controlled, with implications for vitality and well-being.

Preliminary research findings suggest that CC is often experienced as a form of relaxation. This led to the consideration that CC as a potential form of emotional self-regulation (ESR), and defined as a strategy people use to manage emotions during or after an activity [15, 16]: situation selection (SS), situation modification (SM), attentional deployment (AD), cognitive reappraisal (CR), and response modulation (RM).

OBJECTIVE

The aim of the study is grounded in the assumption that PCC primarily foster the satisfaction of SDT needs, which explains why cycling is often experienced as enjoyable and motivating. Over time, this experience may lead individuals to interpret cycling as a resource for ESR. This perspective introduces a novel way of framing CC: not merely as a mode of transport, but as a psychological practice explained through PCC, SDT, and ESR.

Consequently, this study addresses two research questions:

1) Which ESR strategies are present in cyclists' narratives about everyday commuting?

✉ Address for correspondence: Michał Nowakowski Institute of Sociology, Faculty of Philosophy and Sociology, Maria Curie Skłodowska University, Poland
E-mail: m.nowakowski@umcs.pl

Received: 07.04.2025; accepted: 27.10.2025; first published: 14.11.2025

2) How do PCC and the fulfillment of basic psychological needs (autonomy, competence, relatedness) provide a basis for these ESR strategies?

MATERIALS AND METHOD

Study design and context. This qualitative, interpretative study explores CC as an everyday practice and its psychological dimensions. An interpretivist paradigm and an abductive thematic analysis adopted to move iteratively between inductive codes and ESR/SDT concepts. This approach was chosen over grounded theory or phenomenology because the aim was not to build a formal theory or capture lived experience in its entirety, but to explain processual links between practice features, ESR, and SDT. This choice enhances transferability to similar urban contexts and commuting practices.

The research was conducted in Lublin, a city in eastern Poland with approximately 300,000 inhabitants, with an expanding bicycle infrastructure and well-developed public transport. Data collection occurred in two phases: February-April 2020 and July-August 2024. The first phase was interrupted by the COVID-19 pandemic after eight interviews; the second resumed following a grant from the Polish National Science Centre**.**

Researcher characteristics and reflexivity. The first author is an experienced urban cyclist and cycling advocate who commutes by bike daily, and values its positive effects on well-being; the second author does not cycle and prefers driving. Both live in Lublin. It was recognized that the engagement of the first authors could induce privilege autonomy and competence-oriented interpretations. To minimize this bias, inductive coding was initially performed by the first author, while the operationalization of PCC, SDT needs, and ESR was developed independently by both authors, and then reconciled. Coding decisions and theme boundaries were discussed in peer debriefings.

Sampling strategy. Purposive sampling with maximum variation was used to capture diversity in gender, car access, childcare responsibilities, residential location (central, intermediate, peripheral), and engagement level. Two phases of data collection were conducted. In 2020, participants were recruited directly by the researchers and included highly engaged, year-round cyclists, resulting in pragmatic narratives emphasizing efficiency and convenience (although emotional benefits were also noted). In 2024, a research agency recruited a more heterogeneous sample via job listing websites and cycling groups to broaden demographic and lifestyle diversity, and capture commuting practices across varying levels of engagement. Inclusion requirements were adults who regularly used a bicycle for commuting. Those riding exclusively for recreation were excluded.

Ethics. The study complied with national and institutional ethical standards for social research. Formal approval from an Ethics Committee was not required under these regulations because the study involved adult participants and non-sensitive topics. All participants received an information sheet and provided informed consent prior to the interview. Audio files and transcripts were anonymized and stored on encrypted drives accessible only to the research team.

Table 1. Characteristics of study participants

Gender	Women	14
	Men	18
Age	Up to 25	12
	26–39	15
	40–55	4
	56 and over	1
Place of residence	Central districts	10
	Peripheral districts	12
	Suburbs	10
Car use	Yes	22
	No	10
Transporting children to kindergarten or school	Yes	16
	No	16
Economic activity	Active	23
	Inactive	9
CC during the seasons	All year round	6
	Not in winter, with frost, ice, snow and slush on the road	17
	Only when it's warm and dry	9
Frequency of cycling (weekly)	2–3	4
	3–4	3
	4–5	14
	6–7	8
	Hard to say	3

Data collection. Semi-structured interviews were conducted face-to-face, either at the Institute of Sociology in Lublin or in participants' homes. Each interview lasted 45–90 minutes, was audio-recorded with consent, and transcribed verbatim. Topics included cycling frequency and purpose, use of other transport modes, mode choice decision-making, typical routes, infrastructure experiences, motivations, emotional significance, activities while cycling, interactions with others, equipment, and required skills. In the second phase, the guide was further refined to explore the spatial aspects of cycling commuting in more depth, including route choice and evaluation. These adjustments did not alter the core structure of the guide, ensuring comparability across phases.

Data analysis. Transcripts were anonymized and coded using Taguette (taguette.org), an open-source qualitative analysis tool. First, the interviews were coded inductively to capture themes related to features of cycling commuting, without predefined theoretical categories. The initial codebook contained over 200 codes grouped into thematic families:
1) Meanings, motivations and applications.
2) Interactional, technical, tactical and regulatory skills, embodied knowledge and decision-making strategies.
3) Infrastructure, equipment, physical environment, and spatial features.
4) Feelings and perceptions while riding.
5) Life trajectories and cycling habit milestones.
6) Barriers and conditions.

Second, indicators were developed for the presence of PCC dimensions and ESR strategies. Negative cases (e.g., aversion to physical exertion or lack of enjoyment) were

Table 2. Operationalization of PCC dimensions and ESR strategies

Category	Definition	Indicators	Inductive codes
DL	Perceived freedom to steer and schedule the commute.	freedom to choose route, pace, and timing	freedom; speed; pace; modifying route; flexible use – bike path, pavement, road; traffic jams; parking; bike vs public transport; travel time predictability
PS	Mental engagement through sensory or cognitive input.	observing scenery; listening to music or podcasts; physical activity; relaxing	observation; music; thinking, flow; physical activity; meditation; time for oneself; contact with nature; spending time with others
SC	Positive social presence & hostility	rides with children and friends; judging others	empathy; limited trust and anticipation; adopting different perspectives; drivers; pedestrians; cyclists; bike vs safety
PA	Physical demands and sense of personal space.	references to exertion; fitness improvement; crowded buses; crowded streets and sidewalks	adrenaline; physical activity; for fitness; for health; recreation with child; speed; c technique, balance, turns;
IN	Unpredictability and vulnerability to external risks.	fear of unknown routes & of riding on crowded roads; weather variability	adjusting bike to conditions, route; adjusting route to physical abilities; cycling is easy; drivers; pedestrians; cyclists; bike vs safety;
SS	Choosing or avoiding situations to influence emotions.	avoiding traffic jams; hassle of parking; crowded buses; waiting at bus stops; choosing green areas; traffic-calmed routes	freedom; speed; pace; modifying route; flexible use – bike path, pavement, road; bike vs car; traffic jams; parking; bike vs public transport; combining means of transport
SM	Altering external conditions to shape emotional impact.	choosing traffic-calmed routes; away from motor traffic; passing by attractive places; adjusting pace or time of ride	freedom; modifying route; flexible use – bike path, pavement, road; bike vs car; traffic jams; parking; bike vs public transport; travel time predicability; calculating travel time; combining means of transport; outdoors; observation; contact with nature
AD	Focusing or shifting attention to regulate feelings	adding scenic or exploratory elements; physical effort; inducing a state of flow; music;	freedom; physical activity; contact with nature; outdoors; observation; speed; spending time with others;
CR	Reframing the meaning of a situation	cycling as freedom, reframing effort as relaxation; cycling as health bahaviour, recreation, meditation, parenting and bonding with children; city exploration; combining commuting with visits or errands; micro-adventure;	freedom; stress relief; stimulation; adrenaline; physical activity; time for oneself; for health; contact with nature; I like; outdoors; observation; speed; spending time with others; combining different purposes;
RM	Modifying emotional response after it arises	calming down after tensions at home or work; disconnecting through full immersion in the activity; intense pedalling to release tension; slowing down to relax; sprinting for stress relief.	freedom; adrenaline; physical activity; time for oneself; contact with nature; music; observation, flow; stress relief;

explicitly sought to test the robustness of emerging themes. Third, these indicators were linked to inductive codes created in the first step (Tab. 2). Finally, ESR strategies were interpreted in relation to PCC dimensions, treating PCC as contextual features that enable or constrain the enactment of emotion regulation. This step reflected the analytical chain: PCC→inferred need satisfaction (SDT)→ESR, and aimed to clarify how strategies were embedded in the commuting experience. Member checking was not conducted because the study involved two separate data collection phases, which made re-contacting participants unfeasible.

RESULTS

Everyday cycling commuting is described not only as a practical mode of transport, but also as an emotionally meaningful experience. To capture this dual nature, the findings were organized as illustrative quotes from participants' narratives that demonstrate the use of different ESR strategies, and indicate which PCC dimensions (such as decision latitude, psychological stimulation, and social aspects) and SDT needs create conditions conducive to their application (Tab. 3). Although the analytical chain reflects the conceptual logic (PCC→SDT→ ESR), Table 3 is organized to emphasize ESR strategies and their empirical illustration before linking them to PCC dimensions and SDT needs.

These relationships illustrate the analytic chain: PCC features enable satisfaction of SDT needs, creating conditions for ESR strategies that reduce stressors and enhance the psychological benefits of cycling. For RQ1, all five ESR families appeared in narratives, with situation selection and modification most frequent, mainly linked to route choice, timing, and adapting conditions to mood. For RQ2, ESR strategies were tied to PCC features – especially decision latitude (freedom of route and pace), psychological stimulation (sensory and cognitive engagement), and physical aspects (activity level). Cyclists perceive commuting as enjoyable due to the autonomy and competence satisfaction; relatedness plays a minor role. Autonomy emerged through freedom of route, pace control, and adaptability, contrasting with car or public transport constraints. Competence was reflected in navigation skills, time prediction, and flexible infrastructure use, sometimes linked to self-efficacy in other life domains.

Quotes on hostility and insecurity show boundary conditions and strategies to overcome them (e.g., route adjustments, multimodal travel). These indicate where PCC features are absent, limiting ESR benefits. One clear negative case (respondent 19) began cycling for extrinsic reasons (to become more attractive to a colleague), but later valued route flexibility, city accessibility, and physical strength, enhancing autonomy and competence.

DISCUSSION

Summary of results. Narratives revealed all five families of ESR strategies, with situation selection and modification the most frequent. Among SDT needs, autonomy and competence were most salient, while relatedness played a minor role.

Table 3. ESR Strategies in CC: PCC Features, SDT Needs, and Representative Quotes

ESR	Codes	Quotes	PCC	SDT need
SS (SM)	freedom; modifying route; traffic jams; bike vs car;	bicycle also gives me a strong sense of freedom that I'm not standing in traffic jams. I ride to the very front of the queue. and I'm the first to start. And I can choose different routes (25).	DL (self-steerablity)	AUT, COM
SS (SM)	bike vs car; travel time predictability;	once I've chosen the car, I get stressed because I have to be somewhere at a certain time and there are traffic jams. […] then I get on the bike and if I ride at a steady speed, I can roughly calculate how quickly I'll cover the distance […] and really, what could stop me? (02).	DL (temporal flexibility)	AUT, COM
SS (SM)	bike vs public transport; weather; sweating;	it was summer then, it was warm, the bus was terribly crowded, everyone was sweaty, it stank, it was uncomfortable, and I decided I couldn't commute like that – I'll try by bike (28).	PA (personal space & privacy)	AUT
SS (SM)	empathy; adopting different perspectives; drivers; pedestrians;	there are many drivers who believe that cyclists shouldn't be on the roads at all because we get in their way. But no one has ever stopped me or told me that I shouldn't ride here […] when cyclists ride fast and dangerously on pavements, it can immediately provoke some situations with pedestrians. When I ride on a pavement, I usually keep the pace of a pedestrian or only slightly faster. I I've never had anyone scold me for it. So maybe it's a matter of attitude (26).	SC (hostility)	REL, COM
SM (SS)	flexible use – bike path, sidewalk, road; route choice criteria; freedom;	If the street looks bad, I go onto the pavement and ride there; I won't struggle with it, or I choose another route, some shortcut I have in mind to get around; I know there will be a better way, or, for example, it will be a bit longer but better (01).	DL (self-steerablity)	AUT, COM
SM (SS)	modifying route; crowded, traffic	the ravines here ultimately win over the main streets, when commuting to work I'm partly forced to use them, but when I have the option I prefer to choose a ravine (07).	DL (self-steerability)	AUT, COM
SM	fear; flexible use — bike path, sidewalk, road; bike vs safety;	there's a section where the bike path ends but there's a wide pavement, so against the rules I keep riding on the pavement because I'm afraid there (15).	IN (unpredictability)	AUT
SM (CR)	recreation with a child; combining different purposes;	she sat in her child seat on the back and we rode to the kindergarten, and sometimes instead of going straight home, we would take a detour somewhere (16).	SC (positive social presence)	REL
AD (CR, SM)	observation; modifying route;	By bike you can ride into some side streets in a neighbourhood where at night you wouldn't want to find yourself. See how people live, because we move around the city schematically (32).	PS (based on visual or motor capacities)	AUT, COM
AD (CR, SM)	observation; pace; bike vs public transport	it's a nice way to sightsee, better than if I took a bus or a taxi. I can also look around at what's around me. Check out some cool spots. It's not that fast, yet at the same time it's faster when needed — an ideal middle-ground mode of transport (03).	PS (based on visual or motor capacities)	COM
AD (CR, SM)	music; freedom; contact with nature; time for oneself; recreation; relaxation;	that's when the bike, fresh air, and my favourite music in headphones give me a feeling of freedom, of time well spent […] for me, it's also a kind of entertainment and relaxation, I'm alone with myself and that's how I relax, too (06).	PS (based on audio-cognitive capacities)	COM
CR (AD)	physical activity; fredom; satisfaction;	one feels liberated, just different, simply lighter after a bike ride. Even though you get tired, you still rest and feel satisfied that you rode, that you moved (14).	DL (self-steerablity)	AUT, COM
CR (AD)	spending time with others; fear; spending time with others; limited trust and anticipation; relaxation;	If I ride with children, I ride more carefully, because you have to watch the road from every side, and the kids, and definitely keep to the right; and when I ride alone, I simply relax (13).	IN (unpredictability)	AUT, COM
RM (AD)	physical activity; stress relief; relaxation;	then I still feel such a relief. I mean, in the sense that such physical fatigue causes the mind to relax. When I'm either angry or tired, such a fast ride, somehow, well it relaxes (26).	PS (based on visual or motor capacities)	AUT, COM

Interpretation (PCC→SDT→ESR). PCC (route and time flexibility, sense of control, and sensory stimulation) create conditions for autonomy and competence, fostering autonomous motivation. In this context, ESR strategies are activated, reducing stressors (e.g., congestion, crowding) and enhancing positive emotions, which explains why cycling is perceived as pleasant and restorative.

Comparison to previous work. Findings confirm prior evidence on well-being and satisfaction in active mobility [5, 6, 9–11]. Previous studies have conceptualized cycling commuting (CC) as an emotionally and bodily meaningful activity [17, 18, 19], fostering a sense of agency, flexibility, and comfort [20]. These mechanisms were also evident in the present study. However, interpreting CC as a form of emotional self-regulation (ESR) through the lens of Self-Determination Theory (SDT) offers a novel theoretical contribution. Unlike earlier research that focused on behaviour change interventions involving recent modal shifts [21, 22] or on children and adolescents [23, 24], the current study draws on spontaneous accounts of adult cyclists navigating everyday urban life.

A key contribution of this study is the conceptual integration of ESR strategies with PCC dimensions and SDT needs (Tab. 3). This framework clarifies how commuting features enable need satisfaction and emotion regulation, reframing everyday mobility as psychologically meaningful.

Limitations of the study. The single-city setting limited transferability beyond similar urban contexts, and the absence of psychometric measures reduced interpretive precision. Data were collected in two phases, which could raise concerns about temporal bias. However, it increased sample heterogeneity and allowed maximum variation in

commuting practices. A sensitivity check confirmed that core interpretations of the PCC→SDT→ESR chain remained stable across both periods, suggesting robustness despite contextual changes (e.g., pandemic, infrastructure growth).

The single-city context constrains the generalizability of findings beyond similar urban environments. ESR strategies and SDT needs were inferred from qualitative narratives rather than measured with psychometric instruments, which limited the precision of interpretation. The sample underrepresented older and economically inactive participants, reducing the diversity of perspectives in these demographic groups.

Although data were collected in two phases, the design increased sample heterogeneity and supported a maximum variation strategy, which is an important principle in qualitative research. A sensitivity check confirmed that core interpretations of the SDT–ESR analytic chain remained stable across both periods, indicating the robustness of findings despite contextual changes. The change in temporal context (COVID-19 pandemic, expansion of cycling infrastructure, milder winters, and growing pro-cycling and health promotion discourse) may have reinforced conditions conducive to ESR strategies; however, the core mechanisms identified in the study remained stable across both phases. Psychological dimensions, such as autonomy, competence, and emotion regulation strategies remained relatively stable over time, which further reduced the risk of bias. Therefore, the two-phase design should be considered a strength rather than a threat to validity, as it enhanced transferability to similar urban contexts.

Boundary conditions. The psychological benefits of cycling depend on boundary conditions such as weather, infrastructure, distance, and perceived safety. The weather is most influential: year-round cyclists treat it as a challenge, using adaptive strategies (protective clothing, pace and equipment adjustment), while seasonal cyclists engage conditionally, discontinuing during snow, ice, or rain, and employing compensatory tactics (checking forecasts, multimodal travel), and fair-weather cyclists limit trips to comfortable periods.

Cycling infrastructure gaps, and the need to alternate between pavements and carriageways undermine safety and fluidity. While year-round cyclists navigate them flexibly, seasonal riders reroute or switch modes, and fair-weather cyclists rely on dedicated paths. Distance further limits decision latitude, especially in winter or in peripheral areas.

Skill differences shape coping: experienced cyclists show high self-efficacy, while others adopt defensive tactics (pavement use, avoiding traffic). Both strategies can be perceived as manifestations of autonomy and competence – the ability to choose cycling instead of car or public transport, expands the sense of agency and control over mobility.

One negative case (respondent 19) initially cycled for controlled extrinsic reasons (to become more attractive to a colleague). Later, she acknowledged benefits such as greater route flexibility, easier city access, and improved physical strength, which enhanced her sense of autonomy and competence. This illustrates that even externally-driven engagement can create conditions fostering need satisfaction and more autonomous regulation over time.

Implications and significance. Theoretically, this study enriches active mobility research by confirming that PCC relate to basic psychological needs within the SDT framework [12], and by adding ESR as mechanisms explaining how commuters amplify cycling's positive effects. Also highlighted are therapeutic features such as sensory qualities, spatial continuity and rhythmic movement that foster autonomy and competence. These insights point to directions for infrastructure design aimed at increasing active mobility by leveraging knowledge about motivational quality and its impact on well-being. In practice, policies should strengthen basic needs through network continuity, route options, and sensory qualities (e.g., greenery, scenic views) that support positive attentional regulation.

Future research. Recommended:

1) methodological triangulation: combining qualitative analysis with validated SDT needs and ESR measures;
2) cross-city comparisons with different infrastructure and cultural norms;
3) profiling year-round, seasonal, and fair-weather cyclists to identify thresholds for ESR;
4) testing infrastructural and behavioural interventions for their impact on the PCC→SDT→ESR chain;
5) exploring relatedness in group rides or community programmes. Overall, what is often described as 'pleasure', 'reset', or 'flow' in cycling commutes appears rooted in experiences of choice and agency, sustained by everyday strategies of regulating situations, attention, and reactions explaining why cycling consistently supports well-being, and how urban design can maintain it.

CONCLUSIONS

The study reframes CC as a psychological practice rather than merely a transport mode, highlighting how practice features support need satisfaction and ESR strategies. Route flexibility, pace control, and sensory engagement create conditions for regulatory strategies, such as situation selection, attentional deployment, and cognitive reappraisal, which help cyclists manage stress and enhance positive emotions. Through these processes, CC primarily supports autonomy and competence, needs central to intrinsic motivation, while relatedness plays a marginal role in this context.

By integrating SDT and ESR, the study offers a novel interpretive framework that explains why cycling commuting is perceived as enjoyable and motivating. These insights have practical implications: urban mobility policies and infrastructure design should not only aim to reduce emissions and improve health but also foster environments that support autonomy and competence. Future research should validate these findings with quantitative measures, examine differences between cyclist profiles, explore cross-context comparisons, and test interventions that strengthen psychological resources in everyday mobility.

Acknowledgement

The study was funded in part by the National Science Centre: 'Cyclist commuting in a large city as a social practice. Preliminary research.'(Grant No. 2023/07/X/HS6/01101).

REFERENCES

1. Johansson C, Lövenheim B, Schantz P, et al. Impacts on air pollution and health by changing commuting from car to bicycle. Sci Total Environ. 2017;584–585:55–63. doi:10.1016/j.scitotenv.2017.01.145
2. Philips I, Anable J, Chatterton T. E-bikes and their capability to reduce car CO2 emissions. Transp Policy. 2022;116:11–23. doi:10.1016/j.tranpol.2021.11.019
3. Shaw C, Blakely T, Atkinson J, Woodward A. Is mode of transport to work associated with mortality in the working-age population? Repeated census-cohort studies in New Zealand, 1996, 2001 and 2006. Int J Epidemiol. 2020;49(2):477–485. doi:10.1093/ije/dyz257
4. Friel C, Walsh D, Whyte B, et al. Health benefits of pedestrian and cyclist commuting: evidence from the Scottish Longitudinal Study. BMJ Public Health. 2024; 2(1):e001295 doi:10.1136/bmjph-2024-001295
5. Avila-Palencia I, de Nazelle A, Cole-Hunter T, et al. The relationship between bicycle commuting and perceived stress: a cross-sectional study. BMJ Open. 2017; 7(6):e013542. doi:10.1136/bmjopen-2016-013542
6. Chatterjee K, Chng S, Clark B, et al. Commuting and wellbeing: a critical overview of the literature with implications for policy and future research. Transp Rev. 2020;40(1):5–34. https://doi.org/10.1080/01441647.2019.1649317
7. Berrie L, Feng Z, Rice D, et al. Does cycle commuting reduce the risk of mental ill-health? An instrumental variable analysis using distance to nearest cycle path. Int J Epidemiol. 2024;53(1):dyad153. doi:10.1093/ije/dyad153
8. Liu J, Ettema D, Helbich M. Systematic review of the association between commuting, subjective wellbeing and mental health, Travel Behav Soc. 2022;28:59–74. doi:10.1016/j.tbs.2022.02.006
9. Gatersleben B, Uzzell D. Affective appraisals of the daily commute – Comparing perceptions of drivers, cyclists, walkers, and users of public transport. Environ Behav. 2007;39(3):416–431. https://doi.org/10.1177/0013916506294032
10. Wild K, Woodward A. Why are cyclists the happiest commuters? Health, pleasure and the e-bike. J Transp Health. 2019;14:100569. doi:10.1016/j.jth.2019.05.008
11. Martin A, Goryakin Y, Suhrcke M. Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. Prev Med. 2014;69:296–303. doi:10.1016/j.ypmed.2014.08.023
12. Gerpott FH, Rivkin W, Unger D. Autonomous or controlled self-regulation, that is the question: A self-determination perspective on the impact of commuting on employees' domain-specific functioning. Organ Psychol Rev. 2023;13(1):67–95. https://doi.org/10.1177/20413866221133644
13. Deci EL, Ryan RM. The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. Psychol Inq. 2000;11(4):227–268. https://doi.org/10.1207/S15327965PLI1104_01
14. Reckwitz A. Toward a Theory of Social Practices: A Development in Culturalist Theorizing. Eur J Soc Theory. 2002;5(2):243–263. doi:10.1177/13684310222225432
15. Gross JJ. Conceptual foundations of emotion regulation. In: Gross JJ, Ford BQ, editors. Handbook of emotion regulation (3rd ed.). New York: The Guilford Press; 2024. p. 3–12.
16. Webb TL, Miles E, Sheeran P. Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. Psychol Bull. 2012;138(4):775–808. doi:10.1037/a0027600
17. Te Brömmelstroet M, Nikolaeva A, Mladenović M, et al. Have a good trip! expanding our concepts of the quality of everyday travelling with flow theory. Appl Mobilities. 2021;7(4):352–373. https://doi.org/10.1080/23800127.2021.1912947
18. Spotswood F, Chatterton T, Tapp A, Williams D. Analysing Cycling as a Social Practice: An Empirical Grounding for Behaviour Change. Transp. Res. F: Traffic Psychol. Behav. 2015;29:22–33. doi:10.1016/j.trf.2014.-12.001.
19. Guell C, Panter J, Jones NR, Ogilvie D. Towards a Differentiated Understanding of Active Travel Behaviour: Using Social Theory to Explore Everyday Commuting. Soc Sci Med. 2012;75(1):233–239. doi:10.1016/j.socscimed.2012.01.038.
20. Schneider PR. From elements to policies: A Shovian social practice perspective on pathways to facilitate daily E-bike commuting. Transp. Policy. 2023;143: 36–45. doi:10.1016/j.tranpol.2023.08.015
21. Weman K, Sepideh Soheili Shemirani S, Back J, et al. The value of using motivational theory to understand active transport behaviors: a qualitative study of a community-based E-bike project. Psychol Health. 2025;1–19. https://doi.org/10.1080/08870446.2025.2479113
22. Mildestvedt T, Hovland O, Berntsen S, et al. Getting physically active by e-bike: An active commuting intervention study. Phys Act Health. 2020;4(1):120–129. https://doi.org/10.5334/paah.63
23. Burgueño R, Rutberg S, Nyberg L, et al. Adapting the behavioral regulation in active commuting to and from school questionnaire in Sweden: BR-ACS(SWE). Transp Res Interdiscip Perspect. 2022;16:100721. https://doi.org/10.1016/j.trip.2022.100721
24. Schönbach DMI, Marques A, Peralta M, et al. Validation of the need satisfaction in cycling to and from school scale among students from Germany. JCMR. 2024;3,100052. https://doi.org/10.1016/j.jcmr.2024.100052