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ARTICLE

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ABSTRACT

The dominant tradition in transport planning and policy practice considers travel as a derived activity and travel time as an economic disutility. A growing body of literature is challenging this perspective, demonstrating that being 'on the move' is a rich experience interlaced with profound shared and individual meanings that can have positive implications on quality of life, well-being and personal development. Yet, mobility in general, and commuting in particular, is often reported as one of the least pleasant daily experiences and as a source of massive environmental impacts. This exploratory article hypothesizes that flow theory, based on Csikszentmihalyi´s seminal work on optimal states of consciousness, has the potential to offer important insights that can contribute to research and policy action on achieving both sustainable and satisfying forms of daily mobility. The article draws on an online exploratory questionnaire in order to reflect on flow theory in relation to the capacity of different mobility modes to either facilitate or constrain the occurrence and duration of optimal states of consciousness. Preliminary conclusions provide a basis for outlining a set of future research directions aimed at better understanding mobility experiences and their relationships with flow theory.

1. Introduction

Within the traditional transport planning and policy practice, everyday 'being on the move' is typically identified as 'wasted and unproductive time' with negative utility or impedance (Metz 2008; Schiefelbusch 2010; Banister et al. 2013). With this premise, quantifiable travel time reductions remain the main goal of traditional transport planning and policy practice, often neglecting their quality or potential value to travellers (Metz

2008; Schiefelbusch 2010; Banister et al. 2013; Urry 2006; Watts and Urry 2008). These premises are accompanied by the conventional procedures for economic evaluations of transport plans, based on cost-benefit analyses, where the best alternatives are typically those that offer the greatest reduction of travel time. In contrast to this mainstream view of everyday mobility as a disutility, a growing body of research demonstrates that individuals associate mobility with a variety of positive and even transformative experiences (e.g. Bissell 2014; Butcher 2011; Plyushteva 2019; Humagain and Singleton 2020; Jain and Lyons 2008; Milakis et al. 2015; Mokhtarian and Salomon 2001; Paez and Whalen 2010; Price and Matthews 2013; Redmond and Mokhtarian 2001; Singleton 2018a). For example, recent studies on everyday mobility during COVID-19 lockdown showed that many people, especially public transport and active mode users, were missing the time spent on commuting (Aoustin & Levinson, 2021; Rubin et al. 2020). As such, 'intrinsic value of travel' means the value associated to the essential nature of the act of everyday moving, spanning a multitude of dimensions, such as improved personal health (Singleton, 2017) or purpose in life and personal growth (De Vos et al. 2013). Mobilities research has further explained everyday travelling as a fundamental human condition (Cresswell 2006, 20101, 2014; Elliott and Urry 2010), and a social, political, physical, technical and cultural phenomenon (Jensen 2013; Te Brömmelstroet et al. 2017).

Despite these arguments for richness of everyday travelling, people still rate commuting among the least enjoyable and least meaningful daily activities (Kahneman et al. 2004; White and Dolan 2009; Stone and Schneider 2016; Bryson and MacKerron 2017; Adam, Walasek, and Meyer 2018). To provide additional perspectives on the meanings of everyday travelling and associated thinking in planning and policy practice, this paper explores potential insights about mechanisms and manifestations of travel experience from flow theory (Csikszentmihalyi 1990). In particular, we believe that flow theory can provide an additional analytical framework to understand the complex relations between the mental and embodied aspects of different subjective travel experiences. Based on the original definition (Csikszentmihalyi 1977; Csikszentmihalyi and Csikszentmihalyi 1992), flow is an experience that occurs when a person is fully immersed in doing something that provides, level of challenge enough to keep the person concentrated, avoiding boredom or distraction. This experience is profoundly enjoyable, even if mundane, and valuable in its own right. At the same time, it has a transformative aspect that lasts beyond the single experience. According to Csikszentmihalyi, the experience of flow brings order to consciousness, making overall one's life more enjoyable and meaningful, bestowing a sense of control and connectedness to the outer world. This sense of deep enjoyment is highly rewarding, and it is very common to observe people expending a great deal of energy simply to be able to feel it as happens with surfers, dancers, musicians, and gamers. Indeed, opportunities for flow occur in the most disparate contexts amongst which, as Csikszentmihalyi himself recognises (Csikszentmihalyi, Latter, and Weinkauff Duranso 2017), everyday travelling is also one.

However, to date, flow theory is not utilized in transport policies and transport system design and has been rarely used in the field of transport studies, even though there are few noteworthy exceptions which refer to its explanatory potential. Chen and Chen (2011), Bjørner (2019) and Atombo et al. (2017) have used flow theory to complement Ajzen's Theory of Planned Behaviour (Ajzen, 1991) and to provide a nuanced explanation of motorcyclists' and drivers' intrinsic motivations for speeding. Their conclusion is that

the challenge of high-speed driving leads individuals to experience flow, and flow could actually be equally or even more important than the Theory of Planned Behaviour constructs in explaining speeding. Bjørner (2017) discusses some implications of flow in the context of autonomous vehicles prospective use. Harvey, Heslop, and Thorpe (2011) combine flow theory with reversal theory (Apter 2001) to create a model of 'drivers' boredom'. These authors highlight the benefits of maintaining a good level of challenge in driving environments, such as adopting shared spaces, to increase opportunities for flow. In their experiential study of cycling at night, Cook and Edensor (2017) also use flow theory to explain the intrinsic pleasure that some individuals experience through cycling, and describe it as an experience 'where the body's rhythms intersect and clash with those of the earth's, sun's and moon's, the variable intensities and qualities of light, the affordances and features of the landscape and shifting moods, and mindful thoughts and imaginaries that emerge during the course of the journey' (Ibid., p. 17). These studies consider flow theory in relation to a specific mode of travel.

The aim of this paper is to develop a more general dialogue between Csikszentmihalyi's ideas and theories aimed at exploring the intrinsic value of travel. Through this, we explore the theoretical potential of flow theory for mobility studies and for application in transport planning practices. The examination relies on critical analysis of flow theory using an exploratory questionnaire focused on flow states during everyday travelling. The article is organized as follows. In section 2, we provide a summary of the background literature, namely existing debates regarding travel experience (section 2.1), and discuss the general concept of flow as optimal experience (section 2.3) its phenomenology and possible explanations of the state of flow from neurological science (section 2.3). In section 3, we present the design of exploratory questionnaire including sample characteristics. Section 4 presents the analysis of mental states in relation to travel modes, environmental and personal conditions, strategies to achieve or avoid mental states, and effects of mental states. Finally, the article ends with a discussion of findings and an agenda for future research stemming from flow theory.

2. Background

2.1. Overview of previous research on travel experience

As already mentioned in the introduction, a number of scholars have in the last years challenged the rationale of microeconomic consumer theory (i.e. 'homo-economicus' perspective; Urbina and Ruiz-Villaverde 2019) as 'myopic' (Mokhtarian and Salomon 2001), and introduced the idea of 'intrinsic value' of travel. Similarly, several authors have criticised the traditional monetization of travel time savings for the purpose of project appraisal which assumes that infrastructure and service provision is the most important – and even the defining – aspect of high-quality urban mobility (Banister et al. 2013; Jones 2009), often overlooking more individualised or experiential accounts of urban mobility and their effects on urban life and wellbeing (Schiefelbusch 2010). Thus, the dominant 'homo economicus' thinking falls short in recognizing the multidimensional qualities of mobility.

Contrary to the homo-economicus rationale, the 'mobilities turn' in social sciences argues that being on the move is a fundamental condition of human nature – the notion

of *homo mobilis* (Cresswell 2006, 2010, 2014; Elliott and Urry 2010; Mladenović et al. 2019; Van Geenhuizen and Nijkamp 2003). More than simply a means for reaching spatially dispersed activities, mobility choices and rhythms, when repeated daily as in commuting, have great impacts on broader aspects of people's lives (Jensen 2013; Te Brömmelstroet et al. 2017). Instead of being exceptional and exogenous, everyday mobility is endemic and intrinsic to life, society and space (Grieco and Urry 2012) and plays a crucial role in defining, sustaining or transforming subjectivities (Doody 2020). Thus, travelling is as much about social meaning, embodied experience and identity as it is about mappable, predictable, and quantifiable movement patterns (Ferreira 2019). Moreover, daily mobility plays a key role in conveying meaning to places and as a dynamic learning and personal development tool (Simmel 1971; McLuhan 1995; Ferreira et al. 2012).

Even before the mobilities turn, travel experiences during travel activities have received growing attention in transport studies since the early 2000s (see Mokhtarian and Salomon 2001). Similarly, several currents of daily mobility behaviour research are taking a deeper look into the topic (e.g. Schiefelbusch 2010; Gärling 2018; De Vos et al. 2015; Friman, Ettema, and Olsson 2018; De Vos and Witlox 2017). The travel experience focus is underlined due to its recently acknowledged critical role in behavioural change and the possibility of promoting sustainable transport modes (De Vos et al. 2018; Friman, Ettema, and Olsson 2018; Van Acker, Goodwin, and Witlox 2016). For example, consistently positive experiences of a particular transport mode can shape mobility choices towards more frequent use of that transport mode (Friman, Ettema, and Olsson 2018). Starting with an additional focus on the importance of well-being, psychology studies since 2010s uncovered similar findings regarding the shaping of desired behaviour (see Ettema et al. 2010, 2011, 2016; Bergstad et al. 2011; Olsson et al. 2013; De Vos et al. 2013; De Vos, Schwanen, and Witlox 2017; De Vos 2018). Similarly, studies of subjective well-being, such as Kahneman and Krueger (2006), point out that a shift towards a certain behaviour is more likely if the person can link positive emotional responses with it.

Both well-being and travel satisfaction studies abound with systematic research on travel experiences, even when not explicitly employing this term. Earlier well-being studies have shown that the domain-specific context of travel contributes to overall well-being (Olsson, Friman, and Ettema 2018). According to De Vos et al. (2013), travel affects well-being through multiple ways: experiences during destination-oriented travel (Morris and Guerra 2015b; Lyons, Jain, and Holley 2007), activity participation enabled by travel (Ettema et al. 2010), trips where travel is in itself the activity (Mokhtarian and Salomon 2001), opportunities to engage in physical activity (Singleton 2018a), and even due to the anticipation of potential travel (Currie et al. 2010). Previous research mainly focused on the spatial and social factors for well-being, concluding that well-being is subjectively experienced, has multiple dimensions, and encompasses cognitive and affective long-term and short-term aspects (Schwanen and Wang 2014). Mobility scholars argue that the concept of happiness, i.e. the perceived satisfaction of using a particular mode, should be an integral part of project evaluation, as mode selection can be also measured by the derived long-term happiness (see Duarte et al. 2010).

In terms of methodology, travel satisfaction studies analyse the emotions experienced during the trip and in the cognitive evaluation of the trip (De Vos and Witlox 2017; Mao, Ettema, and Dijst 2016). They largely focus on objective elements, such as the interdependencies between travel satisfaction and transport modes (De Vos et al. 2016; Fellesson

and Friman 2012; St-Louis et al. 2014), trip duration (Morris and Guerra 2015a; Milakis et al. 2015; Milakis and Van Wee 2018), the traveller's group (St-Louis et al. 2014; Redman et al. 2013; Gatersleben and Uzzell 2007), residential location (Cao and Ettema 2014; De Vos and Witlox 2017), and waiting time (Friman 2010). In addition, subjective aspects are also examined, such as attitudes (Ye and Titheridge 2017; St-Louis et al. 2014), multi-tasking (Singleton 2018b), growth and relatedness needs (Ingvardson et al. 2019).

The foundation of travel satisfaction methodology is the Satisfaction with Travel Scale (Ettema et al. 2011), a tool that measures travel perceptions in terms of evaluative happiness (cognitive evaluation) and emotional well-being (affective evaluation) (Ettema et al. 2011; Diener 1984). The Satisfaction with Travel Scale is based on the core affects theory (Russell 1980; Västfjäll et al. 2002), where core affects are defined as the building blocks of the individual's current mood or emotional response (Västfjäll et al. 2002). Although there is a myriad of models that explicate the dimensions of core affects, the theory essentially contains two primary dimensions: valence and activation. Valence is the extent of experienced pleasure (ranging from positive to negative), whereas activation is arousal or feeling energized by environmental stimuli (ranging from activated to deactivated) (Västfjäll et al. 2002; De Vos et al. 2015). The theory is based on the idea that it is not possible to feel the two opposite sides of the so-called circumplex (see Figure 1). In regard to the Satisfaction with Travel Scale, Friman et al. (2013) argue that when measuring travel satisfaction, both valence and activation should be measured at the same time.

In addition to well-being and travel satisfaction studies, other research streams have also focused on the richness of travel experience. In his formative study, Schiefelbusch (2010) defines travel experience as the sensual and perceptual impressions acquired through all the senses while travelling. Due to its multisensory nature, different elements of the mobility ecosystem as well as different planning decisions can subjectively shape the travel
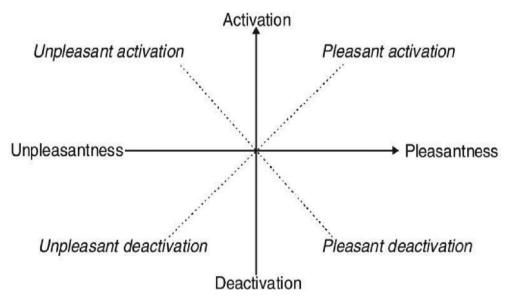

Figure 1. The circumplex model of core affects (Västfjäll et al. 2002).
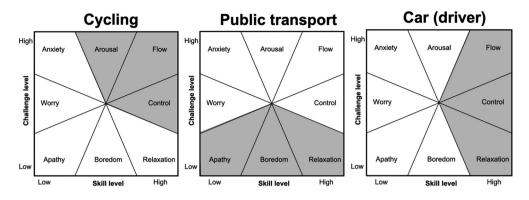
Figure 2. Which of these mental states do your experience frequently while traveling with your primary mode? (designs of these images are inspired from original designs by Csikszentmihalyi 1997).

experience. However, Schiefelbusch points out that the traveller's personal experience is not appropriately accounted for in transport planning decisions. Philosophical aesthetics research also examines travel experience, emphasizing the aesthetic dimension of travel as part of the everyday experiences (Naukkarinen 2005; Maskit 2017). One example of this research strand is explicating the kinaesthetic experience of cyclists as a multisensory phenomenon (Spinney 2009; Forsyth and Krizek 2011; Van Duppen and Spierings 2013; Vivanco 2013; Stefansdottir 2014; Willis, Manaugh, and El-Geneidy 2015). Similarly, several studies examined the experiences during walking (see Bassett 2004; Matos Wunderlich 2008; Middleton 2010; Johansson, Sternudd, and Kärrholm 2016), public transport commutes (see Fellesson and Friman 2012) as well as car travel (see Mann and Abraham 2006; Sheller 2004).

Despite the variety of approaches and outcomes in the literature presented above, the different research fields and authors agree on a key point: travel time cannot be reduced to the commonly measured figures of minutes and equivalent monetary units, because it is infused with profound, multi-layered, and sometimes contradictory meanings. Therefore, travel experiences should not be seen as simply 'getting from A to B' but rather as a multidimensional reality whose comprehensive understanding has required and will still require the input of and dialogue with a variety of theories and methods from several disciplinary traditions. The majority of the studies above has specifically focused on uncovering the positive aspects of being on the move and measuring the levels of satisfaction associated with travelling. Less work has been done in providing explanatory frameworks for the mechanisms and manifestations through which travelling becomes a pleasant experience in the first place. Of the many available theories of human experience in different disciplines, flow theory, which has been surprisingly ignored so far, has certainly great potential to contribute in this direction. Flow theory simultaneously takes into account sensorial, motor, cognitive and emotional processes, bringing together several of the elements of travel experience highlighted by different bodies of literature reviewed above. As such, and as we explore later, flow theory can help bring a further theoretical lens through which to better understand the reasons why in some cases travelling is a key opportunity for lifelong well-being as we will explore in the following sections.

2.2. Outline of flow theory

Initially conceptualized in psychology by Mihaly Csikszentmihalyi, the concept of flow has been studied in depth in many, varied domains: elite and non-elite sports; social activism; aesthetic experience; literary writing; scholarly and creative work; games; computer and web use; education and work (Nakamura and Csikszentmihalyi 2009, p. 200; Csikszentmihalyi, Latter, and Weinkauff Duranso 2017). The central question in these fields is how to enhance the favourable conditions for flow emergence in key areas of everyday life, such as education, work, relationships, and leisure time (ibid. 203). As initially argued by Csikszentmihalyi, everyday travelling can be added to this list. We would further argue that the concept of flow has the potential to further expand the understanding of human scale planning and policy in transport practice.

The state of the flow (often referred to as 'optimal experience') can be characterized as one where sensorial, motor, cognitive and emotional processes are orchestrated in a way that not only facilitates the achievement of the ongoing task but also gives an intrinsic sense of well-being and personal fulfilment. During the state of flow, people can achieve levels of task proficiency and efficiency beyond what is possible in other mental states. As Csikszentmihalyi et al. (2017, p.12) describe, flow is 'a peak moment in time when the body and mind are fully engaged in a specific task and when nothing else seems to matter'.

Conversely, this state of 'psychic entropy' can have very detrimental effects, particularly if experienced often. In the state of psychic entropy, individuals are unable to organize their feelings, thoughts, intentions, and actions in ways that are compatible with mastering the task at hand. Furthermore, states of entropy lead to an intrinsic sense of discomfort and tension, with negative consequences on self-esteem, health and quality of life. The state of the flow does not automatically deliver positive or even desired results. In fact, one can undertake activities that are not aligned with one's values or that have negative consequences on personal well-being or the well-being of others. Consider, for example, compulsive gamblers, speed-
drivers or persons with substance abuse addiction. They experience high intrinsic enjoyment doing activities that are potentially very destructive for themselves, the important people in their lives, but also with adverse consequences to the society at large.

Several experiences are seen as manifestations (or 'outcomes') of the state of flow (Csikszentmihalyi, Latter, and Weinkauff Duranso 2017):

(1) Intense and focused concentration on the present moment: 'Flow [. . .] makes the present instance more enjoyable, [. . .] because it builds the self-confidence that allows us to develop skills and make significant contributions to humankind' (Csikszentmihalyi 1990, 42).
(2) The merging of action and awareness: Flow involves full immersion in the task in question without thinking of experiences in other places or time.
(3) A loss of reflective self-consciousness and lack of absent-mindedness: Flow is neither daydreaming nor the brain's 'default network', activated by internal self-reflecting cognitive tasks like autobiographical memory retrieval, envisioning the future or conceiving the perspectives of others (Buckner, Andrews-Hanna, and Schacter 2008).

(4) A temporary disregard for the sense of the self: Even though during flow individuals temporarily lose some awareness about their own existence (due to total focus on the task at hand), paradoxically the sense of the self as an integrated and harmonious entity emerges stronger after the flow experience is over.

(5) A distortion of temporal experience due to altered subjective perception of time: People who experience flow tend to view time as passing faster than normal; however, the sensation that time slows down has also been reported.

(6) The activity is experienced as intrinsically rewarding (autotelic experience): In other words, individuals enjoy the activity for its own sake and not because they expect to derive social, economic, or health benefits from it.

Thus, flow can be seen as a particularly efficient and pleasurable (leading some authors to call it *optimal*) state of inner experience in which there is order in consciousness. Based on the seminal work of Csikszentmihalyi, who studied how people reach and experience the state of flow in various activities, flow theory postulates several conditions that are conducive to achieve it (based on Csikszentmihalyi 1990, p. 49; Nakamura and Csikszentmihalyi 2009, p. 195; Csikszentmihalyi, Latter, and Weinkauff Duranso 2017, 18):

(A) The activity involves the use of the body. Even though it is possible to achieve flow during activities, such as reading or playing cognitive games, that are physically engaging tend to lead to deeper states of flow.

(B) The task at hand has clear goals. This clarity provides direction and structure, and it is essential that there is a realistic chance to complete the task: if achieving the goal is not possible, interest in the task tends to dissipate.

(C) The environment provides immediate feedback on progress towards achieving the desired goals. This aspect helps the person negotiate any changes in demands and allows adjusting performance, thereby maintaining high levels of attention and interest in the task.

(D) A good balance between the perceived challenges of the task and one's perceived skills. If the task is too easy then there is a loss of concentration, as concentration is not needed to complete the task; if the task is too difficult then there is a loss of confidence and an increase in anxiety, as task completion is seen as impossible.

(E) One must act with a deep but effortless involvement. The person has a sense of control over one's actions, a sense that one can deal with the situation.

2.3. Neurological mechanism of flow

This section explores working hypotheses of neurology that postulate why and how states of flow emerge. We will first introduce the transient hypofrontality hypothesis and the neurotransmitter hypothesis, followed by the exploration of additional mechanisms. Dietrich (2003) proposed that altered states of consciousness can be explained by transient prefrontal deregulation. Each altered state has its own characteristics in terms of specific time distortions, disinhibition from social restraints, or a change in how and on what attention is focused (ibid. 238). This *transient hypofrontality hypothesis* postulates that, as the brain has access to finite resources to execute its functions it has a built-in cap on neural activity: 'the activation of a given structure must come at the expense of others'

(Dietrich 2006, 80). In situations requiring a high level of sensory–motor integration, 'the brain downregulates neural structures performing functions that an exercising individual can afford to disengage'. Siilarly, Kahneman (2011, pp. 39–40) notes that physical activities (at their extremes) seem to compete for resources with the so-called system 2 of the brain (i.e. the logical, conscious part of the brain). Supported by several lines of empirical evidence, it seems that the higher cognitive functions of the frontal lobe and emotional structures in the amygdala experience a decrease in activity when a high level of sensory–motor integration is required (Dietrich 2006, 80).

Six particular neurotransmitters are released in the human nervous system to make it easier for individuals to endure the physical and mental strain imposed by challenging circumstances. Especially, dopamine, anandamide and endorphins decrease the experience of pain that might be associated with the activity (Bujatti and Biederer 1976 These so-called *pleasure chemicals* can potentially explain the intrinsic motivation associated with tasks undertaken under flow states. Due to this chemical aspect, one must be aware of the potentially addictive nature of the state of flow. Indeed, norepinephrine and dopamine raise the heart rate, tighten focus, and help individuals to focus their attention; in response to external challenges, the brain enters a highly alert state (Vaitl et al. 2013; Benson and Proctor 2003). Because of these chemical stimuli, one is able to process more information from the external environment. One of the most important effects of these neurotransmitters, combined with the extra neural capacity that they make available, is increased pattern-recognition abilities and creativity (Krummenacher et al. 2010).

3. Exploratory questionnaire

3.1. Questionnaire design

To explore mental states of flow perceived during travel, we conducted an online exploratory questionnaire. This approach is consistent with our goal of increasing our understanding of how flow theory can be applied to understand mobility experiences. Particularly, we aimed at understanding whether discussing different modes in terms of mental states in general and flow, in particular, resonates with people. Furthermore, we aimed at identifying whether individuals (a) are able to discuss their travel experiences in terms of mental states and (b) can identify environmental triggers (in landscape, urban design, other traffic participants, etc.) and personal triggers (in purpose, destination, time of day, etc.) for particular mental states. Finally, we asked the participants if they have their own personal strategies that they use to experience or avoid certain mental states.

The questionnaire was structured as follows:

- Respondents were asked about their most frequently used transport mode, the eight possible mental states defined by Csikszentmihalyi (1997, p. 31) experienced during travel and the environmental and personal conditions which trigger the aforementioned mental states. These mental states are: apathy, worry, anxiety, arousal, flow, control, relaxation and boredom;
- Respondents were also asked to provide short statements about purposefully adopted personal strategies to actively alter their mental states: either to trigger desirable states or to avoid undesirable ones;

- Respondents were asked about how frequently they experienced several manifestations associated with the mental state of flow (see section 3.1): concentration, merging action and awareness, disregard from the sense of self, perception of time, sense of reward and creativity;
- A last part collected sociodemographic information regarding gender, age, education level, country of residence and level of urbanity of the residence.

3.2. Sampling

The questionnaire was exploratory in nature and did not attempt to be statistically representative (e.g. in terms of population socioeconomic characteristics in a specific country). Since its main aim was to provide more insights of mental states of flow perceived during travel, statistical significance was not of critical importance as there was no intension to extrapolate its results to a wider population. Due to the pandemic restriction, we used our social media channels as a way to collect a convenient sample. The questionnaire was distributed between 2 and 20 February 2020 using both social media platforms (Facebook, Twitter and LinkedIn) and targeted emails to international academic networks. We are aware that these choices and limits lead to a relatively biased group of participants.

The questionnaire was completed by 91 respondents from 19 countries with most respondents coming from the Netherlands, the UK and the US (see Table 1). More males (53%) than females (45%) participated in the questionnaire. The sample is rather diverse in some aspects (i.e. in gender, age, schooling, urban setting and mode) with most respondents belonging to the age group of 31-40 (31%), having a Master's degree (55%) and

Table 1. Socio–demographic characteristics of the sample (N = 91).

Gender		Level of urbanity	
Male	53%	City center	18%
Female	45%	Urban area, but not the city center	46%
Prefer not to say	2%	Outer ring of urban area	14%
Age		Suburban area	15%
21–30	23%	Rural area	5%
31–40	31%	Prefer not to say	1%
41–50	23%	Primary mode	
51-60	16%	Cycling	53%
61 or older	7%	Public transport	30%
Country		Car (driver)	9%
Netherlands	36%	Walking	4%
USA	20%	Other (moped)	1%
UK	14%	Did not reply	3%
Germany	5%	Secondary mode	
Australia	3%	Public transport	24%
Portugal, Sweden, Switzerland	2%	Car	11%
Belgium, Canada, Colombia, Denmark, Finland, Greece, Hungary, India, Mexico, Norway, Poland	1%	Cycling	9%
		Walking	5%
Did not reply	2%	Flying	2%
Educational level			
High school	1%		
Professional course after high school	4%		
Bachelor's degree (e.g. BA, Bsc)	18%		
Master's degree (e.g. MA, Msc, MBA)	55%		
Doctorate (PhD)	22%		

Table 2. Overview of participants' responses to the question 'Which of these mental states do you experience frequently while traveling by your primary mode?' Bold is the most frequently reported mental state per mode.

mental state	cycling		public transport		car (driver)		total	
Apathy	0	0%	8	30%	1	13%	9	11%
Worry	7	15%	3	11%	3	38%	13	16%
Anxiety	4	8%	6	22%	3	38%	13	16%
Arousal	32	67%	4	15%	2	25%	38	46%
Flow	41	85%	4	15%	5	63%	50	60%
Control	32	67%	3	11%	6	75%	41	49%
Relaxation	28	58%	7	26%	4	50%	39	47%
Boredom	5	10%	9	33%	2	25%	16	19%
total #	48		27		8		83	

living in an urban area (46%). The participants use the bicycle (53%), public transport (30%), car as driver (9%) and walking (4%) as primary mode. They also reported public transport (24%), car (11%), the bicycle (9%) and walking (5%) as a secondary mode. Thus, with primary and secondary modes combined, cycling and transit are the most used travel modes, followed by car We excluded walking from our analysis given the limited number of participants using this as primary or secondary mode in our questionnaire. Although the sample never intended to be representative, we acknowledge that it is biased towards urbanites with a higher education degree and strong use of bicycles.

4. Analysis

4.1. Mental states and travel modes

While all mental states are recognized by at least 1 in 10 respondents, the main recognized states are flow (61%), control (51%), relaxation (50%) and arousal (44%).

Looking at the differences between the modes we see that the car drivers in our sample mostly report mental states that Csikszentmihalyi associated with relatively high skill levels for the task but different challenge levels (control, 75%; flow, 63%; relaxation, 50%). These answers are similar to those walking, with 45% control, 54% flow and 44% relaxation. Public transport users mostly recognize mental states related to low challenge levels but divergent skill levels (boredom, 33%; apathy, 30%; relaxation, 26%). Cyclists recognize mostly mental states associated with high skill and challenge levels (flow, 85%; arousal, 67%; control, 67%).

4.2. Mental states, environmental, and personal conditions

The conditions for a flow state are listed in Table 3. Several environmental conditions, associated with a flow state, refer to the wider landscape and urban design (see car driver: 'Urban design quality'; cycling: 'Urban design: beautiful landscape, clever/safe urban design, green spaces/trees'; public transport: 'Beautiful landscape'), while others relate to the traffic situation (see car (driver): 'right amount of traffic'). Respondents indicate that flow requires some other traffic around you with which you interact but without impeding too much on individual freedom to move (see car driver: 'Traveling at my own pace'; cycling 'Others: low number of other cyclists. Negotiating with people

Table 3. Environmental and personal conditions triggering a flow state.

Mode	Environmental conditions for flow	Personal conditions for flow:
Car (driver)	• Highway; right amount of traffic • Steady speed • Urban design quality • In car when conditions are good (nice weather, not too much traffic) and I'm on my own, I am really into the experience of driving • Traveling at my own pace	• Not being tired • Excitement about destination • Being on my own, comfortable
Cycling	• Weather conditions: wind for some, lack of wind and sun for others • Urban design: beautiful landscape, clever/safe urban design, green spaces/trees • Infrastructure: No traffic lights, several say quiet routes, some say lively streets. Easy to understand • Others: low number of other cyclists. Negotiating with people who cross my path	• Not being tired • Good mood, looking forward to rest of day • Being undisturbed • From work to home instead of vice versa • Not being late • Fitness level
Public	transport	• The presence of other travellers present, but not crowded • Rhythm of train • Beautiful landscape
•	Listening to music, chatting, or e-mailing • Happy, clear-headed	

who cross my path', public transport: 'Other travellers present, but not crowded'). This outcome is in line with flow theory suggesting that too little challenge can lead to boredom, while too much challenge can lead to anxiety, with flow conditions being in between. Other environmental conditions that were identified in the questionnaire relate to the weather (car driver: "In car when conditions are good ('nice weather … '; cycling: 'Weather conditions: wind for some, lack of wind and sun for others'). It is important to note that such conditions are different from person to person and emergent, they are not a characteristic of the network or a link, but rather a result of a disaggregated process.

According to the respondents, the personal conditions associated to a flow state include a general level of fitness, being undisturbed/being on their own and 'not being tired'. In car driving, being alone in the car appears to be conducive to flow states – which might represent a problem for policies aimed at promoting trip sharing. In public transport, combining traveling with other tasks (i.e. listening to music, chatting, or emailing) is seen as enhancing a flow state, while for both cycling and driving the destination also matters.

4.3. Strategies to achieve or avoid mental states

Strategies to trigger desirable mental states and avoid undesirable ones were grouped, and the main categories are listed in Table 4. For car drivers, changing speed (driving slower), changing routes (taking attractive or longer routes) and listening to music/radio are strategies to both achieve and avoid certain mental states. Similar strategies are used by cyclists (e.g. taking routes that are safe, aesthetically pleasing, avoiding traffic lights, listening to music, taking longer routes on separated infrastructure, changing speed), but they reported even more ways to have agency over their mental states, including meditation, seeking thrills, and interaction with others (pass travellers, cycling through

Table 4. Personal stated strategies to trigger or avoid certain mental states.

Mode	Strategies to achieve desirable mental states	Strategies to avoid undesirable mental states
Car	• Toggle (favourite) music • Drive slower • Take attractive cross-country routes	• Avoid racing • Play radio to avoid worry and anxiety • Take a longer route with less traffic
Cycling	• Take routes that are safe, aesthetic, avoid traffic lights • Toggle music • Take a longer route on separated infrastructure • Take residential streets • Variation (of route/riding style) • Meditate on emotions/breathing/body • Pass travellers, cycling through red light, seek busy times for travelling	• Avoid long stretches without turns • Slow down/speed up • Avoid noisy routes/pedestrian areas • Take the lane, establish eye contact • Take extra time
Public transport	• Read/listen to music (with same rhythm as vehicle) • Close eyes/meditate • Meet new people/see as much as possible • Sit in sections for carriers; chat with kids	• Leave early/late to avoid rush hour • Take extra time • Always have a book to read

red light, seek busy times). On public transport, there is little to no active agency related to speed and routing. The respondents reported meditating, socializing, reading books, changing departure hour and listening to music as ways to change their mental state. Also, they toggle their travel times or level of engagement with other travellers.

4.4. Effects of mental states

Table 5 shows responses about frequency of different manifestations associated with a state of flow. Sixty-one per cent of the respondents reported that they feel often or very often intrinsically rewarded by the travelling itself. Forty-nine percent of the respondents reported increased creativity during travel with only 26% experiencing the same sense of creativity after travel. Fifty-four per cent of the respondents experience often or very often a merging of action and awareness, while 52% of the respondents experience intense and focused concentration while on the move. Disregard for the sense of self and the slowing down on time are often and very often experienced by 38% and occasionally or never experienced by 36% of the respondents.

Table 6 presents the differences regarding the manifestations of flow state between cycling and public transport (most used modes in our convenience sample). Cyclists experience the theorized manifestations of flow more often than transit users, and the small group of car drivers falls in between these two on all manifestations. This is

Table 5. Manifestations related to flow state for overall sample.

Manifestations	Very often	Often	Sometimes	Occasionally	Never
I experience intense and focused concentration	22%	30%	24%	19%	4%
I experience a merging of action and awareness	13%	41%	20%	19%	8%
I experience a disregard for the sense of self	9%	29%	25%	14%	22%
I experience that time is passing slower than normal	3%	15%	26%	36%	20%
I experience that time is passing faster than normal	8%	24%	31%	20%	17%
I feel intrinsically rewarded by the traveling itself	23%	38%	16%	13%	11%
I experience increased creativity during traveling	19%	30%	22%	15%	13%
I experience increased creativity after traveling	9%	17%	30%	24%	20%

Table 6. Manifestations related to flow state of cycling, public transport and car driving.

Mode of transport	Public transport	Cycling	Difference
I experience intense and focused concentration	2,7	3,9	1,2*
I experience a merging of action and awareness	2,7	3,7	1,0*
I experience a disregard for the sense of self	2,4	3,3	0,9*
I experience that time is passing slower than normal	2,7	2,3	−0,4
I experience that time is passing faster than normal	2,6	3,1	0,5
I feel intrinsically rewarded by the traveling itself	2,6	4,1	1,5*
I experience increased creativity during traveling	2,7	3,7	1,0*
I experience increased creativity after traveling	2,2	3,0	0,8*

(averages of 5-point Likert scale: 1 = never; 2 = occasionally; 3 = sometimes; 4 = often; 5 = very often)
* = significant on 0.05 level (independent T-test)

confirming the hypothesis that more embodied forms of travelling such as cycling more easily facilitate the achievement of intrinsic flow state. The only exception is on the evaluation of the statement 'time is passing slower than normal'. While the neurological theory suggests that the subjective experience of time is altered during flow, it seems that time is more often perceived as passing faster, while the mental state of boredom more often produces a perception of a slower passing of time. The stronger differences are between the 'feeling of intrinsic reward' and 'intense and focused concentration'.

5. Conclusions

5.1. Discussion of findings

This article provided a first exploration of how the concept of flow, or optimal experience, developed by Csikszentmihalyi (1990), could enrich our understanding of human beings on the move. Our exploratory questionnaire provided insights on how flow theory, could help widen and inform the dominant conceptualization of everyday travelling. Preliminary findings from the questionnaire analysis provide insights into the mechanisms and manifestations of flow states during daily mobility practices. As such, this article offers an exploration of the potential for flow theory to be integrated into transport policy and planning interventions aimed at changing current travel behaviours and improving travellers' experience. We acknowledge that the debate it raises is only one of the steps towards this.

We know from previous studies that daily trips rank remarkably low when accounting for meaningfulness and satisfaction, while they are taking up a large part of our daily schedule. However, being on the move does not have to be such a dissatisfying activity as it could possibly meet the five conditions for flow (**A–E**) as outlined in the section 2. Everyday travelling is often an embodied activity, while it also offers rich challenges and feedback mechanisms that individuals can use to trigger their flow state. As illustrated in the questionnaire results, most modes offer the potential for experiencing flow. Despite this overall potential, there are different degrees for optimal experience and different triggering strategies associated with different travel modes. The results of our exploratory questionnaire indicate that flow theory could provide useful insights on individuals' basic motivation to travel and on their experiences that could inform transport policy and transport system design.

On the one side of the spectrum, travel modes that involve physical movement associated with deep bodily involvement and relatively high control over the trip offer more opportunities for experiencing flow. We indeed can see that respondents have highlighted such aspects of control as travel time in relation to speed and route choice variation. Moreover, interaction with others, especially through eye contact, is a way for providing deeper involvement, such as while walking or cycling. On the other end of the spectrum, less embodied modes, such as public transport, can contribute to flow experiences by leaving time to other enjoyable activities, and even mediation. These results have implications in terms of understanding how to design for different modes, by furthering the understanding of differentiated design requirements in practice. For instance, the current focus on reducing stress levels in cycling environments (see e.g. Fitch, Sharpnack, and Handy 2020) can provide more 'flow' opportunities in the context of high anxiety but - taken to the extreme - could eventually also lead to boredom.

In addition, the results of our exploratory questionnaire generally indicate that people recognise flow and other mental states as defined by Csikszentmihalyi in relationship to the level of challenge and skill in their mobility practices. Respondents recognized and listed favourable conditions for flow and strategies that they use to achieve or avoid particular mental states. These results suggest that several negative external conditions – congestion, road noise, unsafe road environment, lack of navigation control, poor weather conditions, appalling travelling environments, aesthetics, crowdedness, highly passive or stressful mobilities – could disturb the flow experience or even generate conditions of 'psychic entropy". This could potentially provide additional explanations for the negative user experiences reported in previous studies for a variety of modes (e.g. peak hour car or public transport commutes). Moreover, the results reinforce and unpack other accounts of the 'dynamic, relational and temporal' nature of travelling experience and habits and their strong dependence on environmental factors (Doody 2020, p.10; Bissell 2014). Again, important information that can be effectively used to inform transport policy and transport system design.

Here, we have to turn to the originally critiqued view of travel as a negative utility, hand in hand with an emphasis on speed and travel time savings, as well as treating infrastructure as the focal object of transport planning and policy-making. Such understanding of the human on the move is a symptomatic sign of the overall inattention to users' emotional and embodied experiences. In practice, this means missing the valuable opportunities to create flow conditions whilst travelling– especially for the more embodied modes, such as walking, running, or cycling. In contrast, there is an increasing emphasis on active mobility in policy and planning, as a necessary component in building healthier, more sustainable, more liveable and more inclusive cities. Thus, such opportunities for creating flow conditions could become key points to be carefully taken into account in transport planning and policy processes.

Overall, expanding our thinking with the concepts offered by flow theory has the potential benefit of refocusing on the inherent immediate and long-term merits of being on the move. First, it could add to our growing understanding of where reports of dismal experiences come from and how we can plan for conditions that allow for higher travel satisfaction. Conversely, it can facilitate planners in thinking about how to prevent flow from happening due to undesirable reasons, e.g. private car speeding. In other words, flow theory might facilitate the adoption of one mode over another,

as well as one specific mobility behaviour over another, and thus encourage healthier, safer, and more sustainable mobilities. The conditions and manifestations also help us to look less at aggregate indicators of traffic and more at the individual traveller as an embodied being, including the relations between her personal characteristics and the specific fitting conditions she need to reach flow states in ways that are in line with the public interest. Finally, bringing in additional understanding from flow theory into practice can help us understand long-term habit reformation in relation to changes of mobility norms. These lifelong processes will certainly relate to the reshaping of the mode of thought and bringing the perspective of selflessness into the mobility debate.

5.2. Limitations and future research

It is important to note here that our findings may not necessarily be applicable to every country or person, empirical evidence shows that behaviour processes and attitudes are influenced by context, cultural background, including norms and values (Atombo et al. 2017). In addition, there is a possible caveat to note here, related to the fact that our sample is biased towards highly literate people, that the methodology is sensitive for recall bias and the specific context of the COVID-19 crisis could have influenced the (recollection) of mental states. Therefore, although being highly promising, the questionnaire results require further validation with a representative and statistically significant sample.

Applying flow theory to mobility can enrich our view of what mobility means for individuals; however, it does not automatically yield implementable policy strategies for transport planning and design solutions. Instead, it postulates a different conceptual perspective for understanding the experience of being on the move by asking different types of questions. We have identified the following seven research lines for future academic inquiries:

- To enhance the understanding of how mobility experiences induce or constrain states of consciousness in general and the state of flow in particular, for instance, by identifying where and how individuals experience flow while travelling, and how the experience of flow is mediated by environmental, traffic-related, and personal factors. Furthermore, it would be important to investigate the subjective perceptions of these experiences: do people value them or even intentionally seek them out in their daily trips? Are these relations dependent on other variables, such as time of day, or trip purpose? It would be beneficial to include such questions into standard mobility surveys.
- To develop insights into the consequences of the flow state for behaviour (mode and route choice, aggressive behaviour or seeking social contact) and reflect on travel behaviour change policies in the context of such findings.
- To study the potential relationship between states of flow while being on the move and the wider effects on society: possible negative consequences by individual flow-seeking behaviour and possible positive effects on creativity, energy for work or school.

- To investigate the relationship between innovations in (smart) mobility technology and the state of flow. For example: how will the introduction of emerging mobility technologies (e.g. autonomous/automated vehicles, electric kick scooters, Mobility as a Service) enhance or inhibit flow?
- To develop methodological practices for understanding the diversity of flow experiences over different spatio-temporal and cultural contexts, in addition to longitudinal variations for individuals.
- To empirically test and operationalize the key mechanisms of flow states. This should help us to include relevant variables into current project appraisal tools for transport planning practices.
- To understand how and why individuals become involved with a given transport technology we should link flow theory to aesthetic theory, play theory, and issues concerned with information interaction. Engagement theory questions the importance of the skills–challenges balance in explaining mental states. Linking these theories can greatly add to our understanding of mobility.

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