

Towards happy and healthy travellers: A research agenda

Jonas De Vos

Abstract

Well-being and health are two important elements contributing to people's quality of life. Although well-being and health have been analysed for many decades, an increased attention since the beginning of this century can be noticed, partly due to new ways of measuring people's subjective well-being and the rapid growth of obesity and obesity-related diseases. Over the past ten years studies have started analysing the link between travel and well-being, mainly focussing on aspects explaining people's satisfaction with travel. However, the role of travel satisfaction has not yet been fully explored, as it can also impact people's travel attitudes, travel behaviour and residential location choice. Previous studies on travel and health have mainly focussed on traffic safety, air pollution and recently also on physical activity. These studies have indicated that physical activity – and as a result overall health levels – are affected by people's residential neighbourhood and travel behaviour (e.g., mode choice). However, a clear picture on how physical activity, the built environment, attitudes and travel behaviour are linked to each other is missing. Furthermore, it is also possible that physical activity obtained by travel (e.g., by walking or cycling) can affect people's well-being and satisfaction with travel. In this paper, a research agenda aiming at a better understanding of the links between well-being, health and travel behaviour is presented. Three objectives can be distinguished: (i) the role of travel satisfaction in explaining travel behaviour, travel attitudes and residential location (choice), (ii) creating new insights into the link between travel and health, and (iii) linking well-being and health in a travel-behaviour context.

Keywords: Travel behaviour; Health; Well-being; Travel satisfaction; Physical activity

1. Background

Before providing a research agenda focussing on the links between travel behaviour, well-being and health, we first give an overview of existing studies on travel and well-being (Section 1.1), and travel and health (Section 1.2). Based on existing literature and research gaps we then – in Section 2 – present three avenues for future research.

1.1 Travel and well-being

For ages, the 'pursuit of happiness' has been acknowledged as an ultimate goal in people's lives. However, happiness has long been considered as 'unscientific' and impossible to measure. Mainly since the 2000s, the situation has changed: measuring subjective well-being as expressed by individuals themselves is being used more and more across multiple disciplines. This research has also been picked up by governments throughout the world. Standard indices of a country's prosperity, such as longevity and Gross Domestic Product are being accompanied by measures of well-being, such as Gross National Happiness (e.g., Frey & Stutzer, 2010; Stiglitz et al., 2009). In Western countries, well-being and happiness have witnessed increased popularity over the past years, which can be demonstrated by an increased number of scientific articles, but also by a multitude of Internet discussion forums, newspaper articles, magazines and books on how to improve one's happiness.

1 In the past decade, studies have started analysing the relationship between travel and well-being. One
2 of the most important elements related to this link is travel satisfaction (De Vos et al., 2013). Travel
3 satisfaction comprises two dimensions; i.e., an affective dimension (referring to emotions experienced
4 during a trip) and a cognitive dimension (referring to an evaluation of the trip) (Ettema et al., 2011).
5 Travel satisfaction can be affected by certain trip characteristics. Numerous studies have indicated that
6 trip duration and travel mode choice have an important impact on how satisfied people are with trips.
7 With longer durations, travellers experience more negative emotions and will evaluate the quality and
8 efficiency of the trip lower, while active travel results in higher levels of travel satisfaction compared
9 to car users and especially public transport users (e.g., Mokhtarian et al., 2015; Morris & Guerra, 2015a,
10 2015b; Olsson et al., 2013; Singleton, 2018; Smith, 2017). Travel satisfaction can also be affected by
11 travel-related attitudes and the built environment. Studies have indicated that positive attitudes
12 towards a certain mode have a positive effect on travel satisfaction when using that mode (De Vos,
13 2018; St-Louis et al., 2014; Ye & Titheridge, 2017), just as residing in a neighbourhood facilitating the
14 use of the preferred travel mode or trip length (in time and distance) will be beneficial for people's
15 satisfaction with travel (De Vos et al., 2016; De Vos & Witlox, 2016).

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17 Travel satisfaction, however, should not only be regarded as an outcome of travel characteristics,
18 preferences and choices, but also as an important element explaining well-being (e.g., life satisfaction)
19 and travel-related elements (e.g., mode choice, travel attitudes) (see De Vos & Witlox, 2017). Besides
20 travel (commute trips in particular) occupying a considerable amount of time which people cannot
21 spend on rewarding activities – therefore negatively affecting people's subjective well-being (e.g.,
22 Stutzer & Frey, 2008) – travel (satisfaction) seems to affect people's satisfaction with life in three ways
23 (De Vos et al., 2013; Ettema et al., 2010; Lancée et al., 2017). First of all, negative/positive perceptions
24 of trips (i.e., mood during – and retrospective evaluations of – trips) can have a direct impact on life
25 satisfaction since experiencing positive emotions stimulates elements positively affecting life
26 satisfaction (such as original thinking, fostering skills, and liking of self and others (Lyubomirsky et al.,
27 2005)). Second, travel can indirectly affect people's well-being as it enables them to participate in
28 rewarding out-of-home activities. As a result, low levels of accessibility – i.e., the ease of reaching
29 destinations – could result in social exclusion (Preston & Rajé, 2007), negatively affecting well-being
30 (Delbosc & Currie, 2011). Third, certain knock-on effects of travel (satisfaction) on other domains of
31 people's lives are plausible. The (perceived) quality of trips can influence the way how individuals
32 perform activities at destinations (e.g., Loong et al., 2017), but also how people value them. Bergstad
33 et al. (2011) and De Vos (2017) have shown that travel satisfaction indirectly affects life satisfaction
34 through satisfaction with activities at the destination of commute trips and leisure trips, respectively.
35 On the other hand, people being satisfied with their life are more likely of perceiving their trips
36 positively compared to people evaluating their life more negatively (De Vos, 2017). Furthermore, since
37 decisions are often based on previous experiences, it is possible that people's mode choice is affected
38 by satisfaction levels of previous trips of the same kind. Travel satisfaction might also influence travel-
39 related attitudes (De Vos et al., 2018) or the residential location choice (as the built environment highly
40 impacts people's way of travelling) (Cao & Ettema, 2014). However, the effects of travel satisfaction
41 on travel attitudes, travel mode choice and the residential location (choice) have not yet been analysed
42 thoroughly.

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1 1.2 Travel and health

2 Mainly in Western countries, overweight and obesity are becoming a major health problem. Since
3 1975, worldwide obesity has nearly tripled (WHO, 2010). This obesity is a major risk factor for
4 cardiovascular diseases (which are the leading cause of death since 2012), diabetes, musculoskeletal
5 disorders and some cancers. Obesity and overweight are mainly caused by a high intake of energy-
6 dense foods that are high in fat, and low levels of physical activity due to the increasingly sedentary
7 nature of many forms of work and ways of moving around. As a result, the WHO recommends that
8 adults engage in at least 150 minutes of moderate physical activity per week, preventing weight gain,
9 improving cardio-respiratory and muscular fitness and lowering the risk of negative health outcomes
10 (WHO, 2010). However, some studies indicate that a longer duration of physical activity is needed to
11 prevent weight gain and negative health effects (Lee et al., 2010; Moholdt et al., 2014).

12
13 Travel can impact people's health in three ways, i.e., through traffic safety, exposure to pollutants, and
14 physical activity (Handy, 2014). Safety has long been the most important health concern in the
15 transportation field. Although fatality rates have been declining in many high-income countries in
16 response to road safety measures in the last five decades (speed limit enforcement, traffic calming,
17 alcohol limits, driver's license examination, mandatory seat belt use, airbag-equipped vehicles, etc.
18 (for a complete overview, see Elvik, 2003)), road traffic injury is still the ninth leading cause of death
19 in the world. Worldwide, more than 1.25 million people die in traffic crashes each year, and between
20 20 and 50 million are injured (WHO, 2015). Traffic safety is affected by travel mode choice; walking
21 and cycling are (on a per-kilometre basis) riskier than driving, although cycling seems far safer in
22 countries with a considerable share of cyclists (e.g., the Netherlands), compared to countries with a
23 limited amount of cycling (e.g., UK) (Pucher & Dijkstra, 2003). Since researchers have linked vehicle
24 emissions to severe air pollution since the 1950s, the health impacts of pollutants from motorised
25 travel has become an important public concern. Exposure to pollutants resulting from motor vehicle
26 emission (such as carbon monoxide, nitrogen dioxide and particulate matter) have numerous negative
27 health effects, such as respiratory diseases, eye and throat irritation, asthma, lung damage, high blood
28 pressure, and even cancer. According to the WHO, outdoor air pollution – of which motorised vehicles
29 are a major source – causes around 3 million deaths worldwide each year (WHO, 2016). Pedestrians
30 and cyclists tend to have lower exposures to vehicle emissions because they are farther away from
31 vehicles compared to people who are in them. However, due to physical exertion active travellers have
32 higher inhalation rates resulting in similar health impacts of air pollution on active travellers compared
33 to users of motorised vehicles (de Nazelle et al., 2011; Schepers et al., 2015). Besides air pollution,
34 motor vehicles also negatively affect health through their contribution to water and noise pollution
35 (Handy, 2014).

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37 Finally, travel can affect health through the amount of physical activity it provides. As indicated before,
38 overweight and obesity – highly affected by physical inactivity – are becoming a major health problem,
39 possibly resulting in diseases such as cardiovascular diseases and diabetes. Choosing to walk or cycle
40 can help people to achieve recommended levels of physical activity (Shaw et al., 2017). Public transport
41 use is also often related with physical activity as many public transport users walk or cycle to and from
42 public transport stops. Driving a car is a sedentary activity, resulting in an increased chance of obesity
43 or being overweight. Trip duration also affects travel-related physical activity and health. Longer
44 durations of active travel are beneficial for people's health, while Frank et al. (2004) indicate that each
45 additional hour of driving a car per day increases people's chances of being overweight by 6%. Martin

1 et al. (2015) found that a switch from car use to active travel or public transport is associated with a
2 significant reduction in body mass index (BMI), while an opposite switch is associated with a significant
3 increase in BMI. Although some studies have already indicated that the residential location has an
4 important impact on people's travel-related physical activity (Saelens et al., 2003; Sallis et al., 2004;
5 Van Dyck et al., 2010), the effect of health and attitudes towards health on travel behaviour, travel-
6 related physical activity and the residential location (choice) remains unknown. In terms of health, this
7 research agenda will focus on physical activity, and not on traffic safety or exposure to pollutants.

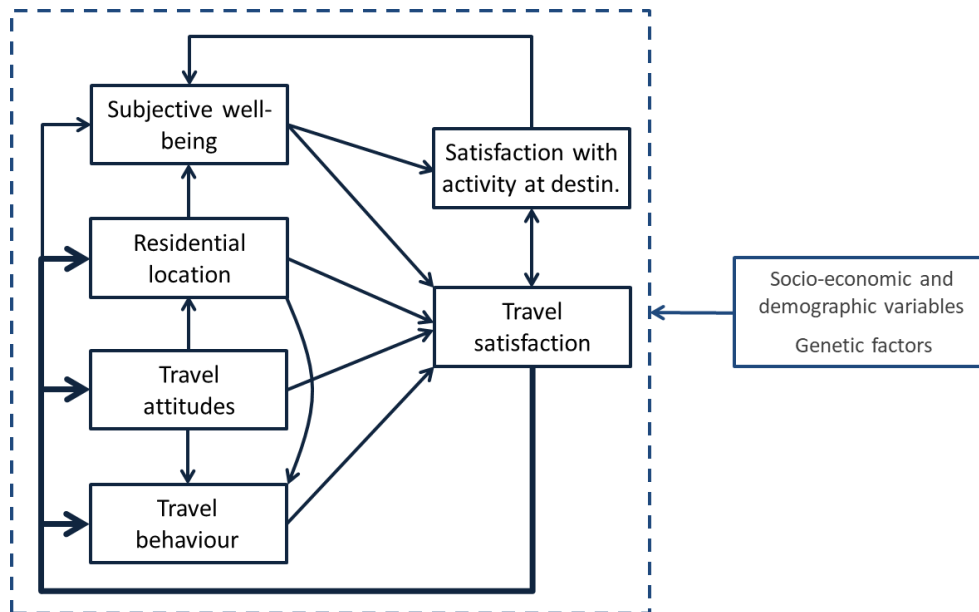
9 **2. A research agenda**

10 Although studies (discussed in Sections 1.1 and 1.2) have already indicated that travel behaviour can
11 affect both well-being and health – two key elements of people's quality of life – the complex
12 relationships between (i) travel and well-being and (ii) travel and health have not yet fully been
13 explored (e.g., De Vos et al., 2013; van Wee & Ettema, 2016). Furthermore, travel-well-being studies
14 and travel-health studies have mainly occurred independent from each other. The research agenda
15 presented in this paper is subdivided into three objectives. First of all, the link between travel
16 behaviour, travel satisfaction and well-being needs further exploration. Although a considerable
17 amount of studies have focussed on travel and well-being, effects from travel satisfaction on travel
18 behaviour, attitudes and the residential location remain under-explored. Second, future studies need
19 to focus on the link between travel behaviour and health. Although studies have indicated that the
20 chosen travel mode and the built environment influence the frequency of physical activity, the links
21 between health, residential location, attitudes, mode choice and physical activity are not yet analysed
22 thoroughly. Finally, the interaction between health and well-being in a travel-related context needs to
23 be examined more conceptually, since travel satisfaction and physical activity are both related with
24 the residential location, travel behaviour and attitudes, but could also influence each other.

26 **2.1 Objective 1: The role of travel satisfaction in explaining travel behaviour, travel attitudes and the 27 residential location (choice)**

28 Although a considerable amount of studies has – over the past ten years – indicated that travel
29 satisfaction is related with long-term well-being and is affected by trip characteristics and attitudes,
30 the role of travel satisfaction as explanatory variable of travel-related elements has not yet been
31 analysed (De Vos & Witlox, 2017). Travel satisfaction might not only impact subjective well-being (e.g.,
32 life satisfaction), it could also influence travel attitudes, future travel behaviour and future residential
33 location choices. Satisfying trips with a certain mode might increase the likelihood that this mode will
34 be used for a future trip of the same kind. This might happen both directly and indirectly, through
35 improved attitudes towards the used travel mode. On the other hand, unsatisfying trips with long
36 durations might worsen people's stance towards travel in general (i.e., travel-liking attitudes) and
37 might consequently increase people's tendency to travel short trips (as long as the built environment
38 does not constrain short trips). Finally, travel satisfaction might also affect residential preferences.
39 People disliking their daily travel patterns might also be dissatisfied with their residential area as the
40 neighbourhood they live in – affecting many travel choices for a substantial amount of time – might
41 prevent them to travel in a desired way. This low residential satisfaction might consequently result in
42 a tendency to relocate to a neighbourhood that stimulates people's desired way of travelling (e.g., by
43 encouraging the use of a preferred travel mode). Although some studies have started analysing the
44 (possible) effect of travel satisfaction on the residential location (choice), travel behaviour and

1 attitudes (e.g., Cao and Ettema, 2014; De Vos et al., 2018), further research is needed. Figure 1, based
 2 on De Vos and Witlox (2017), gives an overview of the explored and under-explored links between
 3 travel satisfaction, well-being, the residential location, attitudes and travel behaviour.¹
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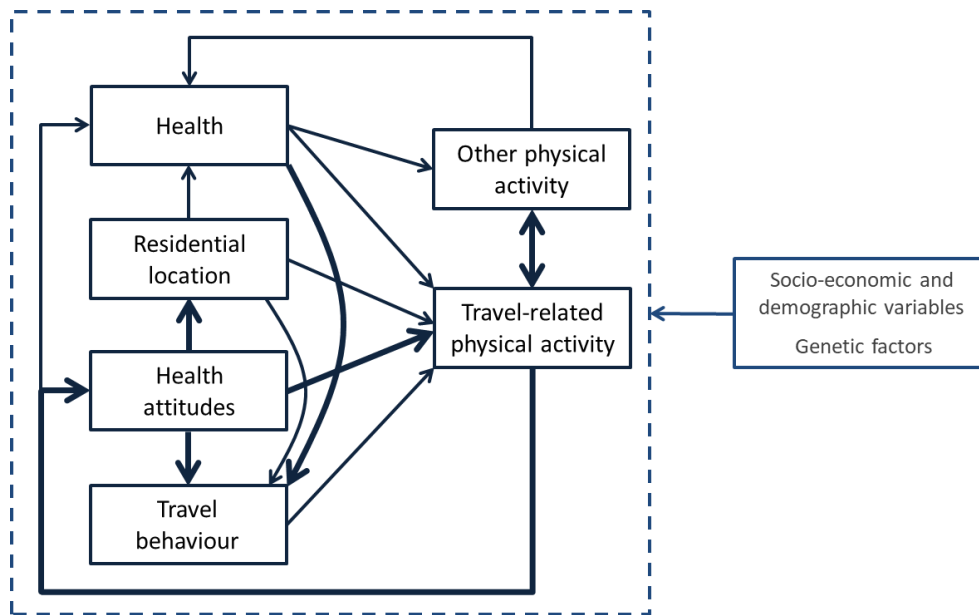
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 6 Figure 1: the role of travel satisfaction in a travel behaviour process (based on: De Vos & Witlox,
 7 2017). Regular line arrows: links previously analysed; bold line arrows: links to be further analysed.
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9 **2.2 Objective 2: Creating new insights into the link between travel and health**

10 Although most research on travel and health over the past decades has mainly been focussing on traffic
 11 safety and air pollution (exposure), studies since the beginning of this century have started analysing
 12 physical activity in a travel context. These studies have indicated that people living in a ‘walkable’
 13 neighbourhood, i.e., a neighbourhood with a high density, a high diversity and good connectivity (e.g.,
 14 a limited amount of T-intersections and dead-end streets), are more physically active, primarily due to
 15 more frequent walking and cycling (Saelens et al., 2003; Sallis et al., 2004; Van Dyck et al., 2010). In
 16 analogy with transport-related self-selection whereby travel preferences influence the residential
 17 location choice (e.g., car lovers preferring to live in low-density suburbs with good car accessibility), it
 18 is also possible that people valuing physical activity have a preference for living in a neighbourhood
 19 with a high ‘walkability’ (or ‘bikeability’). Although Van Dyck et al. (2011) have started analysing this
 20 type of self-selection, it remains rather unclear how attitudes towards health impact travel behaviour
 21 (and mode choice in particular) and the residential location choice. It is also possible that travel-related
 22 physical activity is related with other types of physical activity (van Wee & Ettema, 2016). On the one
 23 hand, people who frequently engage in activities with a lot of physical activity (e.g., sports activities,
 24 non-sedentary work activities) may be more inclined to walk or cycle (and vice versa) as they might

¹ Note that Figure 1 also represents effects from people’s residential location on their travel behaviour (see, for instance, Ewing & Cervero, 2010), from travel attitudes on travel behaviour and the residential location choice (the latter effect representing self-selection effects (see, for instance, Cao et al., 2009)), and from people’s residential location on their subjective well-being (Cao, 2016). Furthermore, socio-economic and demographic variables (age, gender, education level, etc.) and genetic factors are likely to influence the elements shown in Figure 1.

1 have high fitness levels. On the other hand, travel-related physical activity might substitute other forms
 2 of physical activity. Although some studies have analysed certain links between the built environment,
 3 travel behaviour, and physical activity, a global picture of all possible links is still missing. Based on the
 4 conceptual models from De Vos and Witlox (2017) and van Wee and Ettema (2016) a new conceptual
 5 model can be created (Figure 2), showing the relationships – between health, physical activity, travel
 6 behaviour, attitudes and the residential location (choice) – that need further analysis. Similar to Figure
 7 1, it is likely that all elements described above are affected by people’s sociodemographic variables
 8 and genetic factors.
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11 Figure 2: Hypothesised relationships between elements related with travel and health (based on: De
 12 Vos & Witlox, 2017; van Wee & Ettema, 2016). Regular line arrows: links previously analysed; bold
 13 line arrows: links to be further analysed.
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2.3 Objective 3: Linking well-being and health in a travel-behaviour context

16 In order to get better insights into people’s overall quality of life, it is important to link physical health
 17 and subjective well-being with each other. Figures 1 and 2 clearly indicate similarities in the way that
 18 well-being and health are related with travel. For instance, the residential location affects both well-
 19 being (Cao, 2016) and health (Giles-Corti et al., 2016) in direct and indirect ways; travel attitudes
 20 (mode-specific attitudes, travel-liking attitudes) and health attitudes can both affect the residential
 21 location choice and travel behaviour decisions (e.g., Cao et al., 2009; Van Dyck et al., 2011). Travel
 22 satisfaction and travel-related physical activity seem both affected by the residential location, attitudes
 23 and travel behaviour. Furthermore, health and well-being are also related with each other. Health is
 24 often regarded as an important determinant of life satisfaction (e.g., Diener et al., 1999). In this
 25 context, it is also possible that travel-related physical activity affects people’s satisfaction with travel.
 26 The relatively high levels of travel satisfaction of cyclists and pedestrians (e.g., Morris & Guerra, 2015b;
 27 Olsson et al., 2013; Singleton, 2018; Smith, 2017) could be explained by the physical exercise active
 28 travel provides. On the other hand, high levels of satisfaction with life and good mood are beneficial
 29 to one’s physical health (Diener & Chan, 2011). The link between well-being and health in a travel-
 30 related context clearly needs further exploration.

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