Exploring the relationship between the commuting experience and hedonic and eudaimonic well-being

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Abstract

Studies linking commuting and well-being have received increasing attention in the field of mobility and transport. However, most studies primarily focus on the relationship between commuting and hedonic well-being. Few studies have investigated the commuting experience and eudaimonic well-being. Therefore, the aim of this paper is to explore the relationship between the commuting experience and both hedonic and eudaimonic well-being, using Heze (China) as a case study. The results indicate that, first, educational attainment is related to hedonic well-being, and transport mode is related to both the commuting experience and hedonic well-being. Furthermore, we found that some combinations of individual characteristics and transport mode are related to the commuting experience and hedonic well-being, but none of them relates to eudaimonic well-being. In addition, there are strong positive correlations between the commuting experience and hedonic well-being, between the commuting experience and eudaimonic well-being, and between hedonic and eudaimonic well-being. We also found that commuting by public transport, walking and cycling is more likely to improve the quality of the commuting experience, and both hedonic and eudaimonic well-being. In terms of policy implications, policymakers and transport planners should, therefore, promote people's well-being by prioritising the development of sustainable transport, and encouraging greater use of public transport and active travel.

Keywords

Commuting experience; hedonic well-being; eudaimonic well-being; travel behaviour; transport planning

Highlights

- We examine the relationship between the commuting experience and eudaimonic well-being.
- Educational attainment is related to hedonic well-being
- Individual characteristics are related to the commuting experience and hedonic well-being.
- Travelling by public transport, walking and cycling can improve eudaimonic well-being.
- Ways of measuring the commuting experience, hedonic and eudaimonic well-being are discussed.

1. Introduction

One of the ultimate goals of sustainable transport policies and projects should be the promotion of a higher level of well-being rather than just focusing on increased mobility. Various scholars have theorised about the nature of well-being. Ryan and Deci (2001: 142) examined academic theories about well-being, suggesting that the concept of well-being can be summarised as: 'optimal psychological functioning and experience'. Psychological functioning refers to the ability to realise individual goals within one's own environment and the external environment (Preedy and Watson, 2010). The concept of experience includes the experience of pleasure and the experience of having a sense of purpose and meaning in life (McMahan and Estes, 2011b; Ryff, 1989). McMahan and Estes (2011b) proposed that well-being plays a role in individuals' cognitive representations of the nature and experience of well-being. These concepts usually centre on two different but related philosophies: (1) hedonism and (2) eudaimonism (Kagan, 1992; McMahan and Estes, 2011a, 2011b; Ryan and Deci, 2001; Waterman, 1993; Waterman, Schwartz and Conti, 2008). McMahan and Estes (2011a: 95) argue that 'Hedonic and eudaimonic approaches to well-being can be further distinguished by the degree to which they rely on subjective versus objective criteria for determining wellness'. Some scholars have also suggested ways of measuring hedonic well-being and eudaimonic well-being, such as the Beliefs about Well-Being Scale (BWBS) (McMahan and Estes, 2011b), the Satisfaction with Travel Scale (STS) (Ettema et al., 2011) and the Flourishing Scale (FS) (Diener et al., 2010). In addition, an increasing number of studies have examined the relationships between individual characteristics (e.g., age, gender, educational attainment and

occupation) and well-being (Oguz et al., 2013; Stradling et al., 2007; Zijlstra and Verhetsel, 2021), and between travel characteristics (e.g., travel time and mode choice) and well-being (Choi, Coughlin and D'Ambrosio, 2013; De Vos et al., 2016; Ye and Titheridge, 2017; Zhu et al., 2019).

Although previous studies have explored the relationship between the commuting experience and well-being, some research gaps remain. First, few studies have discussed affective factors and relevant measures of the commuting experience when investigating the relationship between commuting experience and well-being. Second, most studies have tended to focus on the relationship between travel and hedonic well-being (De Vos, et al., 2013; Ye and Titheridge, 2020; Zhu et al., 2019), while only a few empirical studies have considered the relationship between eudaimonic well-being and travel (Mokhtarian, 2019; Vaitsis, Basbas and Nikiforiadis, 2019). Third, because previous studies of Chinese cities have primarily focused on mega cities rather than medium-sized or small cities (Ye and Titheridge, 2019; Zhu et al., 2019), the policy implications derived from them may not be transferrable to a broader range of cities. Thus, this paper aims to fill the research gaps by exploring the relationship between the commuting experience and hedonic and eudaimonic well-being, using Heze, a medium-sized Chinese city, as a case study. It makes three main contributions to the existing literature. First, this empirical study investigates the relationship between travel behaviour and both hedonic and eudaimonic well-being. Second, it contributes to furthering our knowledge of the indirect relationship between commuting and eudaimonic well-being. Third, it enriches our knowledge of the relationship between travel and the quality of the commuting experience, both

in terms of hedonic and eudaimonic well-being, in developing countries.

This study is organised as follows. Section 2 is a review of the existing literature regarding the journey experience, hedonic well-being and eudaimonic well-being. Section 3 comprises an introduction to the case study and the methodology. Section 4 presents the results of the empirical study. Section 5 discusses the findings. The final section summarises the study and provides policy implications.

2. Literature review

2.1 Journey experience

Enhancing the journey experience is essential for the future of public transport, especially from a user perspective. Yet, journey quality, and affective factors in particular, are poorly understood (Hickman et al., 2013). Through a study of leisure travel, Anable and Gatersleben (2005) considered that affective factors are as important as instrumental factors with regard to the journey experience. Carreira et al. (2014: 39) defined the journey experience as 'the total individual responses originating from all passenger interactions with the transportation service and across all moments of transportation provision'. Recent studies have mainly focused on the journey experience in relation to public transport (Hine and Scott, 2000; Stradling et al., 2007). Through qualitative research, Hine and Scott (2000) found transport interchange to be one of the key factors affecting the journey experience, generally impacting negatively on public transport users. Stradling et al. (2007) analysed experiences of bus journeys and summarised

63 eight underlying factors that affected them: safety concerns, preference for walking/cycling,
64 service availability, unwanted intrusions, preference for car travel, cost, difficulties resulting
65 from disability and discomfort, and self-perception. Their results showed that gender had a
66 statistically significant effect on safety and service availability, and age had an impact on seven
67 of the eight factors (except for self-perception) (Stradling et al., 2007). However, this research
68 did not take other individual characteristics into account, such as educational attainment and
69 occupation. The utility of travel is dependent on instrumental, attitudinal and affective factors
70 (Hickman et al., 2015; Steg, 2005). Hickman et al. (2013) conducted a door-to-door journey
71 survey and subsequently developed the Journey Experience Scale (JES), a 36-item Likert Scale
72 that can be used to measure journey experience. The JES includes instrumental dimensions (e.g.,
73 flexibility and cost), attitudinal dimensions (feelings about the quality of facilities), and
74 affective dimensions (e.g., whether people felt interested or bored, relaxed or anxious). Carreira
75 et al. (2014: 35) described another scale that can be used to measure journey experience
76 composed of 28 items and divided into seven dimensions: 'individual space, information
77 provision, staff skills, social environment, vehicle maintenance, off-board facilities, and ticket
78 line service'. Furthermore, in order to make soft interventions (Sloman, 2006) or wiser choices
79 (Cairns et al., 2004) to enhance the journey quality, it is essential to first gain a clear
80 understanding of the journey experience.

81 In this study, the journey experience primarily refers to the commuting experience.
82 According to the Collins English Dictionary, commuting can be defined as the activity of
83 regularly travelling to work, and this generally excludes travelling for social purposes, such as

shopping and visiting friends, etc. Chatterjee et al. (2020) reviewed and summarised previous studies and concluded that commuting has the lowest positive affect scores and the highest negative affect scores compared with other daily activities. The commuting experience consists of instrumental factors and affective factors. Anable and Gatersleben (2005: 164) defined instrumental factors as 'short-term individual instrumental costs and benefits of a particular journey such as convenience, predictability, flexibility and monetary costs' and 'longer term collective factors such as health and fitness and the environment'. Because affective factors have previously been poorly understood (Hickman et al., 2013), this study focuses specifically on the affective experience of commuting. Anable and Gatersleben (2005: 164) defined affective factors as 'feelings evoked by travelling, such as stress, excitement, pleasure, boredom and control'. Existing studies on affective factors in relation to the commuting experience have primarily focused on stress (Chatterjee et al., 2020). Chatterjee et al. (2020) indicated that crowding, congestion and unpredictability can induce commuting stress. However, improving the service quality can reduce commuting stress by decreasing the time spent on commuting and increasing predictability (Wener, Evans and Boately, 2005). By comparing the levels of stress experienced by commuters using different travel modes, some more recent studies have demonstrated that commuting by walking or cycling is the least stressful method, while commuting by car is associated with the highest level of stress (Gatersleben and Uzzell, 2007; Legrain, Eluru and El-Geneidy, 2015). In addition, the weather has a greater effect on those who use active modes of commuting (Böcker, Dijst and Faber, 2016), while Legrain, Eluru and El-Geneidy (2015) argued that feeling safer and more comfortable within their surroundings can reduce the amount of commuting stress experienced by pedestrians. Based on a study of

106 commuters in San Francisco, Ory et al. (2004) found that commuters prefer modes of
107 commuting that involve less stress. Individual characteristics can also affect the levels of stress
108 experienced by commuters. For example, Wener, Evans and Boately (2005) showed that women
109 are more sensitive to commuting stress. Via a study of employees at the University of Surrey,
110 Gatersleben and Uzzell (2007) investigated other dimensions of the commuting experience.
111 Participants were asked to assess, for example, whether they found it pleasant, depressing,
112 exciting or boring. The responses showed that cyclists were more likely to feel pleasure and
113 excitement, pedestrians were more likely to find their commute pleasant and non-arousing, car
114 users reported sometimes feeling depressed but also experienced higher levels of excitement,
115 while public transport users found commuting depressing and boring (Gatersleben and Uzzell,
116 2007). Increases in the amount of time spent commuting lead to a lower level of satisfaction
117 with the commuting experience (Morris and Guerra, 2015). If the increase is caused by delays,
118 the commuting experience is unpleasant for both drivers and public transport users, while
119 pedestrians and cyclists regard safety and route quality as key factors affecting their enjoyment
120 of the commute (Chatterjee et al., 2020).

121 2.2 Hedonic well-being

122 The hedonic approach has dominated transport-related well-being studies. Kagan (1992),
123 Kahneman, Diener and Schwarz (1999) and Ryan and Deci (2001) proposed that hedonic well-
124 being is determined subjectively and is composed of pleasure and happiness. Similarly,
125 McMahan and Estes (2011b: 268) defined hedonic well-being as 'includ[ing] the experience of
126 pleasure, a lack of unpleasant experiences, and life satisfaction'. Waterman et al. (2010) also

emphasised that hedonic well-being is concerned with the subjective experiences of pleasure rather than the source of pleasure. Subjective well-being (SWB) refers to the way people experience their quality of life, focusing on satisfaction with life and the extent to which they experience pleasant feelings (Diener, 1984; Ettema et al., 2011). More specifically, SWB consists of two affective components (the presence of positive emotions and the absence of negative emotions) and one cognitive component (judgements: life satisfaction), which can be summarised as happiness, and which is used as a reference for measuring transport-related SWB (Cao and Ettema, 2014; Diener, 1984; Kahneman and Krueger, 2006; Kahneman, Wakker and Sarin, 1997; Ryan and Deci, 2001; Singleton and Clifton, 2021). Because there are no distinctions between the sources of well-being in the SWB paradigm, measures of SWB assess the overall level of satisfaction, which includes, but does not distinguish between, hedonic and eudaimonic well-being (Waterman et al., 2010). Disabato et al. (2016) stated that the tripartite model of SWB (two affective components and one cognitive component) has been widely adopted to conceptualise hedonic well-being. Ryan and Deci (2001) emphasised that the hedonic approach focuses on SWB, and almost exclusively cited work on SWB when reviewing relevant theories and empirical research on hedonic well-being from the psychology literature. Most research into hedonic well-being uses the assessment of SWB as a measure of the former (Diener and Lucas 1999). Therefore, SWB with regard to the journey experience can be used to represent transport-related hedonic well-being in this study.

In recent years, increasing attention has focused on satisfaction with travel (Cao and Ettema, 2014; De Vos, 2019; Ettema et al., 2011; Ye and Titheridge, 2017; Ye, De Vos and Ma,

2020). In this paper, the journey primarily refers to commuting (Wu, Wang and Zhang, 2019; Zhu et al., 2019; Zijlstra and Verhetsel, 2021) – only focusing on the activity of regular travel to and from work and excluding social transit. The impacts of commuting time and commuting mode on commuting satisfaction/subjective well-being has also received attention within the existing literature. By exploring the impact of commuting time on SWB, some studies have identified a negative association between commuting time and commuting satisfaction; thus, people usually have lower levels of satisfaction or SWB if trips are longer in duration (Choi, Coughlin and D'Ambrosio, 2013; Zhu et al., 2019; Zijlstra and Verhetsel, 2021). This outcome seems logical and is supported by other studies showing that, in general, longer commutes are stressful and are, thus, more likely to have negative impacts on commuters (Gatersleben and Uzzell, 2007; Koslowsky, Kluger and Reich, 1995). Based on data from the 2014 China Labour-force Dynamics Survey, Yin et al. (2019) also found that commuters with longer commuting times have lower levels of satisfaction regardless of which commuting modes they choose. In addition to commuting time, commuting mode choice also significantly affects SWB. Many studies have confirmed that active travel has a more positive effect on SWB than motorised travel (Abou-Zeid and Ben-Akiva, 2011; Smith, 2013; St-Louis et al., 2014; Ye and Titheridge, 2017). Abou-Zeid and Ben-Akiva (2011) and Smith (2013) suggested that those who commute by bicycle and/or on foot have significantly higher levels of commuting satisfaction than their counterparts who commute by public transport or car. Based on a single-mode survey conducted among commuters in Canada, St-Louis et al. (2014) found a similar outcome; i.e., cyclists and pedestrians are more likely to feel satisfied with their commutes than car drivers and bus users. Ma and Ye (2019) found that people who cycle are more likely to experience positive impacts

on their mental health than those who walk. However, there is little consensus on the relationship between commuting patterns and SWB in the literature. For instance, Zhu et al. (2019) explored 13,261 individual, 124 city, and 401 neighbourhood samples from the 2014 China Labour-Force Dynamics Survey and found the opposite; commuters who walk or cycle are more likely to have lower levels of subjective well-being than commuters who use other modes of travel. This was due to sub-standard sidewalks and bicycle lanes, a lack of safety measures and traffic pollution; hence, the experience was not pleasurable. Ye and Titheridge (2017) observed that people who commute by electric bikes have relatively lower levels of satisfaction. In addition, traffic congestion is an underlying factor that increases commuting stress, leading to lower levels of commuting satisfaction (Ye and Titheridge (2017). Based on a sample survey of 6,422 respondents in Beijing, Wu, Wang and Zhang (2019) found that people using shuttle buses tend to have higher levels of satisfaction than those using other modes of transport, particularly in congested traffic conditions. Zhu et al. (2019) also investigated the impacts of individual characteristics (e.g., education and gender) on SWB. They found that people with higher levels of educational attainment tend to have higher levels of SWB, and females living in urban areas are more likely to have higher levels of SWB than males. Although conventional wisdom and research suggest that commuting is a stressful activity (Koslowsky, Kluger and Reich, 1995), most studies on the impact of travel found that about half of the subjects were relatively happy with their commute and had found their recent experiences of commuting pleasant (Singleton and Clifton, 2021).

2.3 Eudaimonic well-being

Happiness is not an end in itself, and the focus of well-being should be on realising one's true potential value (McMahan and Estes, 2011a; Ryff, 1989). Fromm (1947) asserted that well-being can be achieved by satisfying objectives and valid needs rooted in human nature. A eudaimonic view conceptualises well-being in terms of cultivating personal strengths and conferring greater benefits; i.e., the eudaimonic dimension of 'flourishing' (Aristotle, trans. 2000), which involves following one's inner essence and profoundly held values, feeling more than just happiness and pleasure, emphasising the achievement of self-worth and goals (Waterman, 1993), realising one's true potential values (Ryff and Keyes, 1995), and the experience of a purposeful and meaningful life (Ryff, 1989). Existing concepts of eudaimonic well-being diverge widely, but there are two key points on which they agree; they contain some components of self-development/personal growth and meaning in life, and they do not contain any affective components (Ryan and Deci, 2001). While the hedonic approach focuses on subjective well-being, the eudaimonic approach focuses on psychological well-being (PWB) (Ryan and Deci 2001; Schwanen, 2021). PWB is the most common factor in the theory of eudaimonia and can be equated to positive functioning (Ryff and Singer, 1998). Ryan and Deci (2001: 141) defined eudaimonic well-being in terms of 'the degree to which a person is fully functioning.' McMahan and Estes (2011b: 269) summarised previous research and defined eudaimonic well-being as 'includ[ing] the experience of meaning or purpose, the development of personal strengths, and contribution to society'. Waterman et al. (2010: 41) pointed out that eudaimonic well-being 'has emerged as both a complement and contrast to subjective well-

being (SWB) for understanding and studying quality of life.' In short, eudaimonic well-being, which focuses on PWB (Ryan and Deci, 2001; Schwanen, 2021), emphasises objectively beneficial experiences (Kagan, 1992).

Some research has explored the specific content of eudaimonic well-being. When describing the eudaimonic approach to well-being, Ryan and Deci (2001) and Waterman et al. (2010) drew on previous work by Ryff and colleagues on PWB (Ryff, 1989; Ryff and Keyes, 1995; Ryff and Singer, 2008). Ryff (1989: 1072) identified six dimensions, which they considered essential to the quality of life, which were subsequently adopted by Ryan and Deci (2001), namely: 'self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth'. These can be used to reflect the quality of life in terms of eudaimonic well-being, 'derived from the development of a person's best potentials and their application in the fulfilment of personally expressive, self-concordant goals' (Waterman et al., 2010: 41). However, not every study agrees with the division of eudaimonic well-being into these six dimensions. In their recent academic work, Diener et al. (2010) optimised previous research and reported that eudaimonic well-being can be divided into five main measurable dimensions: social relationships, optimism and self-respect, a purposeful and meaningful life, engagement and interest, being competent and capable at activities. Having meaning in one's life is essential to eudaimonic well-being (Ryan and Deci, 2001), and this can be increased by undertaking eudaimonic activities related to self-development and contribution to society (Waterman, 2005). Positive subjective experiences and a higher level of well-being result from these eudaimonic activities according to the concept of eudaimonic well-being

(Diener and Lucas, 1999). Furthermore, McMahan and Renken (2011) found that the concept of eudaimonic well-being is positively associated with self-reported well-being and having a meaningful life.

Travel affects both hedonic and eudaimonic well-being (De Vos et al., 2013). Based on previous studies, hedonic well-being has been generally understood well, whereas eudaimonic well-being has been largely ignored. De Vos et al. (2013: 426) emphasised that 'well-being is more than satisfaction and affect, and activities that are enabled by travel and/or that people undertake during trips allow them to achieve a sense of purpose and meaning in life'. Using a questionnaire survey conducted in Thessaloniki, Vaitsis, Basbas and Nikiforiadis (2019) explored the relationship between six factors (safety, comfort, physical health, self-confidence, autonomy and mental health) and travel mode choice, and concluded that factors relating to eudaimonic well-being have a significant impact on travel mode choice. The results showed that walking scored higher than other travel modes, cycling scored highly regarding physical, self-confidence, autonomy and mental health, but lower in terms of safety and comfort; public transport was rated significantly lower because of the poor quality of public transport services in the city. Some individual characteristics are closely related to eudaimonic well-being; for example, Ryff and Singer (2008) identified a close relationship between educational attainment and eudaimonic well-being. More specifically, educational attainment is positively related to personal growth and purpose. These findings are supported by Dowd's (1990) observation that the opportunities for realising oneself are unevenly distributed and dependent on resource allocation, which enables only some to make the most of their talents and capacities. Ferguson

and Gunnell (2016) stated that differences between women and men in terms of eudaimonic well-being are equivocal and claimed that research has demonstrated significant differences between genders. However, other studies have found minimal gender differences. Thus, evidence relating to gender differences in terms of eudaimonic well-being is conflicting across the literature. Based on the Hedonic and Eudaimonic Motives for Activities (HEMA) scale, Huta (2016) identified little connection between eudaimonic well-being and gender and age (Huta and Ryan, 2010). Although some studies have focused on occupation function, no clear relationship between occupation and eudaimonic well-being has been identified. Therefore, this research examines the associations between individual characteristics (e.g., age, gender, educational attainment and occupation) and eudaimonic well-being.

2.4 Measurement of hedonic well-being and eudaimonic well-being

Most academics generally agree that hedonic well-being/SWB consists of two affective components (the presence of positive feelings and the absence of negative feelings) and one cognitive component (life satisfaction) (Diener, 2009; Diener, 1984; Singleton and Clifton, 2021). The two affective components are related to how people feel over a short time-period, and the cognitive component is related to how people feel in the long-term (De Vos et al., 2013). The Swedish Core Affect Scale (SCAS), the Positive and Negative Affect Schedule (PANAS), and the Scale of Positive and Negative Experience (SPANE) can be used to measure the affective components of SWB (Diener et al., 2010; Västfjäll et al., 2002; Watson, Clark and Tellegen, 1988). The PANAS and the SCAS were developed to measure feelings in the short-term, while the SPANE is an alternative to the PANAS and SCAS (De Vos et al., 2013; Diener

et al., 2010). The Personal Well-Being Index (PWI) and the Satisfaction with Life Scale (SWLS) can be used to measure the cognitive components of SWB (Cummins et al., 2003; Diener et al., 1985). Given that SWB contains both affective components and cognitive components, Ettema et al. (2011) developed the Satisfaction with Travel Scale (STS), based on the SCAS (Västfjäll et al., 2002) and Russell's model of core affect (1980). The STS, designed to measure travel-specific SWB, consists of two affective factors and one cognitive factor, and has been widely used to explore commuting satisfaction regarding travel modes and travel time. Each factor comprises three items. There are six affective items – 'three which distinguish between positive deactivation (e.g., relaxed) and negative activation (e.g., time pressed) and three which distinguish between positive activation (e.g., alert) and negative deactivation (e.g., tired)' (Ettema et al., 2011: 170). The three items that comprise the cognitive factor relate to the overall quality and efficiency of transport services. Singleton and Clifton (2021: 307) described the STS as 'using nine pairs of adjectives or statements assessed on a seven-point semantic differential scale'. Previous studies have confirmed that this measurement structure, comprising three components (two affective and one cognitive) is consistent with the theory (Friman et al., 2013; Glasgow et al., 2018; Olsson et al., 2012). Singleton and Clifton (2021) also maintained that the STS is an effective instrument to assess hedonic SWB concerning travel. Because the STS is comprised of relatively limited components and items, it is impossible to use it to conduct more in-depth investigations of the sources of travel-related SWB; thus, the STS is not suitable for measuring eudaimonic well-being in the travel domain.

Given the volume and diversity of the existing eudaimonic literature, Haybron (2016: 43)

295 focused on self-report scales and summarised five representative approaches to eudaimonic
296 well-being as follows: ‘Self-Determination Theory (Ryan and Deci, 2001; Ryan, Huta and Deci,
297 2008); Psychological Well-Being (Keyes, 2007; Ryff, 1989; Ryff and Singer, 2008); Personal
298 Expressiveness (Waterman, 1993; Waterman, Schwartz and Conti, 2008); PERMA [positive
299 emotions (P), engagement (E), relationships (R), meaning (M), accomplishment (A)] (Seligman,
300 2011); and The Flourishing Scale (Diener et al., 2009)’. Brandel, Vescovelli and Ruini (2017)
301 summarised a total of twelve instruments that can be used to measure eudaimonic well-being
302 and applied four of them to measuring the eudaimonic well-being of clinical populations,
303 namely: the Mental Health Continuum (Keyes, 2002; Keyes, 2005; Keyes, 2006), the
304 Flourishing Scale (Diener et al., 2010), the General Causality Orientations Scale (Deci and
305 Ryan, 1985), and the Orientations to Happiness Subscales (Peterson, Park and Seligman, 2005).
306 Similarly, Singleton and Clifton (2021) summarised three commonly-used scales: the Personal
307 Well-Being Scale (PWS) (Ryff, 1989), the Questionnaire for Eudaimonic Well-Being (QEWB)
308 (Waterman et al. 2010), and the Flourishing Scale (FS) (Diener et al., 2010). It is clear from this
309 that the Flourishing Scale (FS) has received widespread attention and been applied in various
310 studies. The FS, developed by Diener and colleagues, describes ‘important aspects of human
311 functioning ranging from positive relationships, to feelings of competence, to having meaning
312 and purpose in life’ (Diener et al., 2010: 146) and can be used to effectively assesses overall
313 self-reported psychological well-being. The FS consists of eight-items that relate to five
314 dimensions: purpose and meaning in life, contribution to others, supportive relationships, being
315 respected, interest and engagement in activities, self-respect, optimism, and competence
316 (Diener et al., 2010). However, fewer studies have explored travel-related eudaimonic well-

being. Singleton and Clifton (2021) explained that it is not always easy to apply existing measurements to the travel domain, while questionnaires cannot necessarily capture implicit travel-related eudaimonic motivations and responses. Travel-related eudaimonic motivations are directly associated with three needs: relatedness, autonomy and competence, which are derived from Self-Determination Theory (SDT); 'this is another perspective that has both embraced the concept of eudaimonia, or self-realization, as a central definitional aspect of well-being and attempted to specify both what it means to actualize the self and how that can be accomplished' (Ryan and Deci, 2001: 146; Ryan, Huta and Deci, 2008). Diener et al. (2010) verified that items in the FS correlate to these three needs; thus, the FS can be used to capture and reflect eudaimonic travel motivations. On the one hand, the FS can measure most dimensions of eudaimonic well-being; on the other hand, the FS contains considerably fewer items than other measurement scales (e.g., PWS), which makes it more concise, accessible and feasible to use when conducting a survey. Proctor and Tweed (2016) also suggested that the FS could be considered as a suitable means of measuring eudaimonic well-being.

2.5 Connections between journey experience, hedonic well-being and eudaimonic well-being

The concept of well-being usually centres on two divergent but related philosophies: hedonism and eudaimonism. Hedonic well-being focuses on subjectively pleasant experiences, whereas eudaimonic well-being concentrates more on experiences that are objectively beneficial for the individual (Kagan 1992; McMahan and Estes, 2011a; Ryan and Deci, 2001). In the case of hedonic well-being, pleasure or happiness is viewed as an end in itself; in contrast, from the perspective of eudaimonic well-being, the goal is to realise one's true potential value,

and the value of the eudaimonic activity itself prompts the activity rather than the accompanying subjective experiences (Ryan and Deci, 2001; Waterman, Schwartz and Conti, 2008; Waterman et al., 2010). On the one hand, McMahan and Estes (2011b) found that, compared with hedonic dimensions, eudaimonic dimensions are more strongly associated with the experience of well-being. On the other hand, empirical research is unable to determine the precise relationship between the hedonic approach and psychological health, but it has been established that eudaimonic well-being is positively associated with healthy psychological functioning (McMahan and Estes, 2011a; Steptoe, Deaton and Stone, 2015). Therefore, eudaimonic, rather than hedonic, may be a more important overall concept of well-being. Steger, Kashdan and Oishi (2008) also claimed that hedonic well-being, obtained from simple pleasant experiences, is likely to disappear in the short term – although there is also the hedonic treadmill suggesting that subject well-being is relatively stable. In contrast, eudaimonic well-being gained from beneficial individual developmental experiences is likely to last for a long time. Waterman, Schwartz and Conti (2008) proved a robust positive correlation between hedonic and eudaimonic well-being measures using the Personally Expressive Activities Questionnaire-Standard Form (PEAQ-S). Waterman and colleagues also suggested that an asymmetry exists between hedonic and eudaimonic well-being; thus there is greater probability of an activity receiving a higher score in terms of hedonic well-being when it scores highly in terms of eudaimonic well-being; however, there is lower probability of an activity scoring highly with regard to eudaimonic well-being when it is rated highly in relation to hedonic well-being (Waterman, 1993; Waterman, Schwartz and Conti, 2008).

Two standard hedonic and eudaimonic well-being classifications are used in the existing literature when measuring well-being in the travel domain. Singleton and Clifton (2021) deemed that measures of SWB should include both hedonic (components of affective and cognitive) and eudaimonic approaches. However, most studies have maintained that the hedonic approach focuses on SWB, while the eudaimonic approach focuses on psychological well-being (PWB) (Diener and Lucas 1999; Disabato et al., 2016; Ryan and Deci, 2001; Ryff, 1989; Ryff and Keyes, 1995; Ryff and Singer, 1998). Thus, in this study, we adopt the STS (related to SWB) to measure hedonic well-being and the FS (based on PWB) to measure eudaimonic well-being. Previous studies have indicated that, compared with hedonic motivations, eudaimonic motivations are more directly related to well-being (Henderson, Knight and Richardson, 2014; Huta and Ryan, 2010). As previously mentioned, travel-related eudaimonic motivations are generally directly associated with the three needs from Self-Determination Theory: relatedness, autonomy and competence (Ryan and Deci 2000, 2001; Ryan, Huta and Deci, 2008). Although eudaimonic travel motivations are implicit, items from the FS correlate with these three needs from Self-Determination Theory (Diener et al., 2010); thus, the FS may capture and reflect travel-related eudaimonic motivations.

There is increasing evidence to indicate that well-being is affected by different aspects of transport, including individual, social, and environmental factors (De Vos et al., 2013; Mokhtarian, 2015). Overall, existing studies have mainly focused on three elements: 1) investigating the impacts of specific aspects of the commuting experience (e.g., commuting time and mode choice) on commuting satisfaction (Choi, Coughlin and D'Ambrosio, 2013; Wu,

Wang and Zhang, 2019; Ye and Titheridge, 2017; Zhu et al., 2019; Zijlstra and Verhetsel, 2021); 2) exploring the distinction and association between hedonic and eudaimonic well-being (McMahan and Estes, 2011a; 2011b; Kagan 1992; Ryan and Deci, 2001; Steger, Kashdan and Oishi, 2008; Waterman, 1993; Waterman, Schwartz and Conti, 2008); and 3) examining the associations between individual characteristics (e.g., age, gender, educational attainment and occupation) and journey experience and well-being (Oguz et al., 2013; Stradling et al., 2007; Zijlstra and Verhetsel, 2021). However, first, few studies have investigated affective factors and the relevant measurement of the commuting experience; second, few studies have explored the relationship between the commuting experience and eudaimonic well-being. Our paper, therefore, aims to fill the research gaps by simultaneously exploring the commuting experience, hedonic well-being and eudaimonic well-being.

3. Case study, data and methodology

3.1 Case study

Heze, a developing, medium-sized city in the southwest of Shandong Province, China, located at the centre of four provinces: Shandong, Jiangsu, Henan, and Anhui, was chosen as the case study area for this research (Figure 1). The administrative planning region of Heze consists of 2 districts, 7 counties and 2 development zones, having, in 2019, a total land area of 12,238.62 km^2 and 8.78 million residents. In this study, the discussion and analysis mainly focus on the downtown area and urban fringe area, including Mudan District, the Economic

and Technological Development Zone, Dingtao District and the High-Tech Industrial Development Zone.

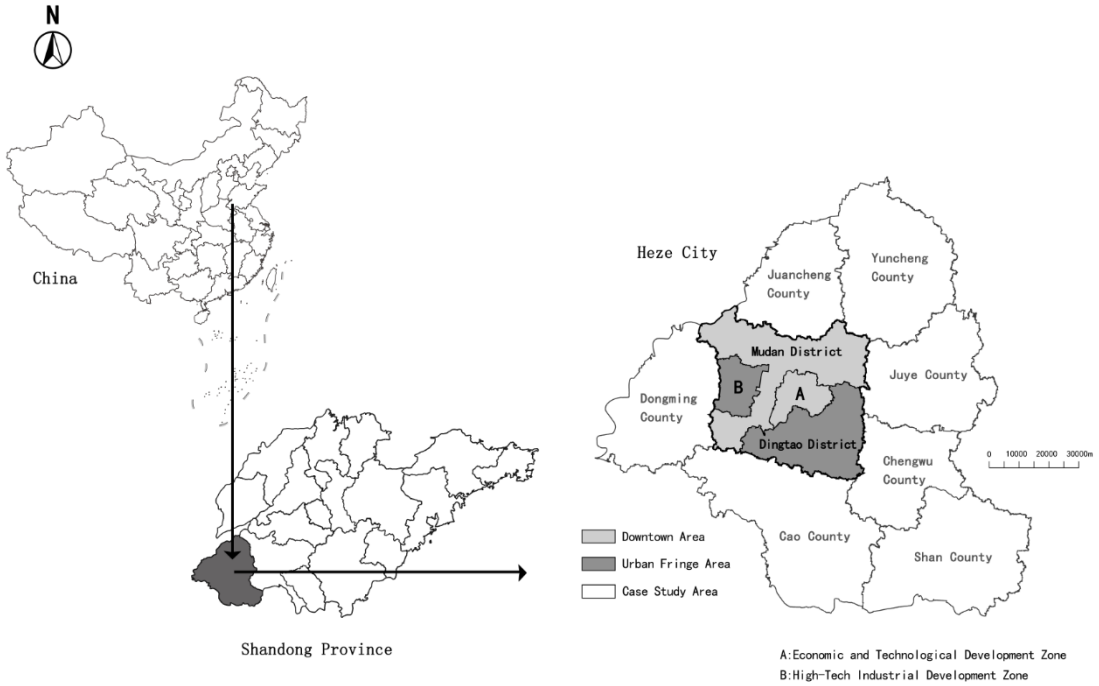

Fig. 1. Case study map of Heze (Source: Authors)

Previous research on Chinese cities has primarily focused on mega cities, such as Beijing, Shanghai, and Xi'an, rather than smaller cities. Consequently, the policy implications derived from previous studies may not be transferrable to a broader range of cities because of their differential characteristics. Therefore, by focusing on Heze, the study supplements existing policy implications to address transport problems and promote well-being in relatively small Chinese cities.

3.2 Data source and data sample

Data were collected in two stages, from May to July 2019, in Heze. In the first stage, we

interviewed 14 planning practitioners; in the second stage, we distributed 263 questionnaires to local residents and eventually collected 188 valid samples. We used a random sampling approach involving face-to-face surveys, similar to the approach previously used by Cao and Hickman (2019, 2020). A mixed approach, encompassing both quantitative and qualitative methods, was applied to obtain more critical research outcomes.

3.2.1 Practitioner interviews

The practitioner interviews covered three topics: 1) current transport issues; 2) transport development opportunities; and 3) attitudes of government policymakers and planners towards different transport modes. The practitioner interviews briefly introduced some basic contextual information about the transport system in Heze, which can be used to support local and regional policy making.

3.2.2 Paper questionnaire

The paper questionnaire contained four parts: 1) individual characteristics; 2) travel behaviour; 3) journey experience; and 4) hedonic and eudaimonic well-being. Individual characteristics comprised gender, age, occupation and education. In this study, travel behaviour refers to daily commuting mode choice; for example, cars, buses, walking, bicycles, and electric bicycles. It should be noted that buses are the only public transport option available in Heze as there is currently no metro system. The Journey Experience Scale (JES), which contains twenty items, as shown in Table 1, was developed from the Door-to-Door Journey Survey conducted by Hickman et al. (2013). The JES was used to quantitatively assess the commuting experience.

The scale contains five degrees of evaluation and ranges from -2 (strongly disagree) to 2 (strongly agree). The Satisfaction with Travel Scale (STS) (Ettema et al., 2011), which contains nine items (Table 2), is used to measure hedonic well-being and includes affective and cognitive components. Each item is rated on a scale ranging from -3 (strongly negative) to 3 (strongly positive). The Flourishing Scale (FS) (Diener et al., 2010) (Table 3), is used to measure eudaimonic well-being and covers eight essential items relating to eudaimonic dimensions of well-being. Each item is rated on a scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Table 1 Journey experience scale (JES) (Hickman et al., 2013)

	-2 Strongly disagree	-1 Disagree	0 Neutral	1 Agree	2 Strongly agree
I felt safe and secure on the journey link					
The journey was quick and convenient					
The journey was cheap					
Using this mode is good for my status					
Access to my usual travel mode is quick and easy					
I arrived punctually					
The carriage/cabin was comfortable with good seats and plenty of space					
There was no congestion on the route					
I hardly needed to wait for a transfer during the journey					
The carriage/cabin was not too noisy					
Wifi was available and easy to use					
There was some opportunity for social interaction					
The route was clean					
There was good protection against the weather					
I enjoyed being in the fresh air					
I benefited from doing some exercise					
I could pop into the shops or visit other things on the way					
I could read or listen to music					

I could enjoy the view and scenery	
I felt happy and relaxed	

441

442 **Table 2** Satisfaction with travel scale (STS) (Ettema et al., 2011: 170)

		-3	-2	-1	0	1	2	3	
Positive deactivation to negative activation	Time pressed								Time relaxed
	Worried I would not be in time								Confident I would be in time
Positive activation to negative deactivation	Stressed								Calm
	Tired								Alert
	Bored								Enthusiastic
	Fed up								Engaged
Cognitive evaluation	Travel was worst I could remember								Travel was best I could remember
	Travel was low standard								Travel was high standard
	Travel did not work well						`		Travel worked well

443

444 **Table 3** Flourishing Scale (FS) (Diener et al., 2010: 148)

	1	2	3	4	5	6	7
	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
Purpose and meaning							
Supportive relationships							
Engaged							
Contribute to others							

Competence
Good person
Optimistic
Respected

Table 4 shows the descriptive analysis of our data. Comparing all the transport modes, the number of respondents who used public transport (buses) and active travel accounted for only around 30% of the total, of which active travel (e.g., walking and cycling) amounted to 15%. Respondents who commuted by car accounted for the largest proportion at 40%. Levy (2013) claimed that financial, cultural, physical, locational and gender-related factors may affect an individual's choice of transport mode. Due to financial constraints, 42% of respondents in the age-range 18-24 chose buses as their most utilised mode of commuting. Feng (2017) found that older adults in Nanjing were heavily reliant on walking, public transport and cycling. This result is also in line with our findings, which show that 78% of people aged over 65 in Heze use buses or walking as their primary travel modes. In addition, 43% of government officials were likely to use private cars, while 36% of teachers tended to use electric bikes, possibly because of the trade-off between traffic congestion and traffic speed on their journey to work.

Table 4 Descriptive statistics (n=188)

Categories		**Frequency**	**Percentage (%)**
Gender	Male	74	39
	Female	114	61
Age	18-24	36	19
	25-44	94	50
	45-64	40	21
	65+	18	10
Educational Attainment	Below bachelor's degree	34	18

Occupation	College	38	20
	Undergraduate	99	53
	Postgraduate	17	9
	Government official	42	22
	Doctor	14	7
	Teacher	28	15
	Company or factory worker	42	22
	Freelance or businessman/woman	20	10
	Student	24	13
	Retiree	18	10
Transport Mode	Cars	76	40
	Buses	29	15
	Walking and cycling	28	15
	Electric bicycles	55	30

3.3 Quantitative methods

3.3.1 Analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA)

The ANOVA test allows comparison of two or more groups simultaneously to determine whether there is a relationship between them. The generalised ANOVA is used for testing a categorical factor when one needs to calculate explained and residual sums of squares (SS), degrees of freedom (d.f.), mean squares (MS) and the F-ratio, as shown in the following equations (Doncaster and Davey, 2007: 10) (see Table 5):

$$SS_{\text{exp}} = \sum_{i=1}^{a} n \cdot (\bar{y}_i - \bar{\bar{y}})^2 \quad (1)$$

$$SS_{\text{res}} = \sum_{i=1}^{a} \sum_{j=1}^{n} (y_{ij} - \bar{y}_i)^2 \quad (2)$$

Table 5 Generalised ANOVA table (Doncaster and Davey, 2007: 10)

Coefficient	Formula

$d.f._{\exp}$	$\alpha - 1$
$d.f._{res}$	$(n\text{-}1)\ \alpha$
$MS_{\exp}$	$SS_{\exp} / d.f._{\exp}$
MS_{res}	$SS_{\exp} / d.f._{res}$
F-ratio	$MS_{\exp} / MS_{res}$

ANOVA uses the F statistic to compute the probability P. The probability P is the significance value between the variables being analysed, and the factor is deemed to have a significant effect if $P < 0.05$ (Doncaster and Davey, 2007).

MANOVA, which can be used to examine multiple dependent variables, is used to assess the following three dimensions: 1) whether the independent variables have statistically significant effects on dependent variables; 2) the interactions between dependent variables; and 3) the interactions between independent variables (Singh, 2018).

3.3.2 Regression

Regression is used to examine the strength and character of the relationship between one response (dependent) variable and one or more predictor (independent) variable(s) (Rutherford, 2011). The Cartesian coordinate system can be used to generate a regression curve that corresponds with the regression function (PSECS, 2019; Seltman, 2018). The basic equation for the regression model takes the following form (Rutherford, 2011: 10):

$$Y_{\mathrm{i}} = \beta_0 + \beta_1 X_{\mathrm{i}} + \varepsilon_i \tag{3}$$

Where:

i: denotes values for the i^{th} subject (where i = 1,2,..., n);

$\hat{Y}_i$: is the predicted dependent variable score for the i^{th} subject;

β_0: is a constant (the intercept);

β_1: is a coefficient (the slope of the regression line);

X_i: is the value of the independent variable recorded for the same i^{th} subject;

ε_i: is the random variable parameter denoting the error term for the same i^{th} subject.

The regression equation can be simply expressed as:

$$Y = \beta_0 + \beta_1 X \tag{4}$$

Where:

$$\beta_0 = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \tag{5}$$

$$\beta_1 = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \tag{6}$$

When $\beta_1 > 0$, there is a positive correlation between X and Y; When $\beta_1 < 0$, there is a negative correlation between X and Y. The multiple R, as the correlation coefficient, reveals the strength of the linear relationship; R squared, as the determination coefficient, indicates the number of points on the regression line. The multiple R and the R squared values continuously range from 0 to 1. A multiple R value closer to 1 means a stronger relationship, while an R squared value closer to 1 means that more values fit the regression model.

4. Results

4.1 Results of practitioner interviews

In response to the question, 'What are the current problems with transport in Heze?', the practitioners identified fourteen main problems from which each practitioner chose what they perceived as the five most important. Table 6 illustrates how often the transport issues listed were chosen by practitioners. The percentage value corresponds with the scale; thus, for 'Serious traffic jams' the scale is 12, as twelve practitioners identified this problem. As the fourteen practitioners taking part each selected five main problems, the percentage for the first item is 12/(14*5)=17.14%. A higher scale value indicates that the problem is considered more serious. The three most serious problems identified were traffic congestion, resulting in longer commuting times, low levels of satisfaction during journeys, and limited choice of public transport mode (bus is the only option, see Fang et al., 2021).

Table 6 Current transport problems in Heze

Current Problems	**Scale**	**Percentage（%）**
1. Serious traffic jams	12	17.14
2. Limited public transport system (only buses available)	10	14.29
3. Lower levels of satisfaction during journey	10	14.29
4. Lack of funds	7	10
5. Lack of interconnecting stations and modes of transfer	5	7.14
6. Service provision is lagging behind rapid city expansion	5	7.14
7. Lack of parking lots	4	5.71

8. Lack of effective traffic management	4	5.71
9. Low level of public transport services	3	4.29
10. Low level of urbanisation	3	4.29
11. Inadequate road network structure	3	4.29
12. No long-term planning by local government	2	2.86
13. Disparity between government theory and practice policy	1	1.43
14. Public expectations cannot be adequately met	1	1.43

Each practitioner selected 5 problems that they considered most serious.

In response to the question: 'What opportunities are there for transport development in Heze?' the practitioners identified eight opportunities and selected the five they considered most important (see Table 7). The percentage value corresponds to the scale. A higher scale value means that the corresponding opportunity is considered more important. Due to Heze's superior location, the practitioners stated that different levels of government provided varying levels of support for transport development.[1] They believed that the local government preferentially promoted development of sustainable transport, including walking, cycling and public transport. Considering the current lack of public transport options (only buses currently available) and the low quality of public transport services, the local government has decided to build a metro system to give people more transport options.

Table 7 Opportunities for transport development in Heze

[1] Heze has an outstanding locational advantage, being at the junction of Shandong, Henan, Jiangsu and Anhui provinces, and is also located within the coverage of the Central Plains urban agglomeration and the Shandong Peninsula urban agglomeration under the next national key plan. However, the current transport system has some failings, such as the lack of multiple public transport modes, lack of transfer stations, the incomplete road network and lack of relevant services, so the practitioners felt that the government should make this a greater priority.

Opportunities	Scale	Percentage (%)
1. Local government to promote and implement sustainable transport, such as walking, cycling and public transport	12	17.14
2. Strong funding support from central government	10	14.29
3. Provincial government proposes development policies and programs	10	14.29
4. Light rail, subway, and tram development plan	10	14.29
5. Improve quality of public transport	9	12.86
6. People-oriented policy and planning strategies	7	10
7. Increase construction of parking lots	6	8.57
8. Strengthen traffic demand management	6	8.57

533 Each practitioner selected 5 opportunities that they considered most important.

534 Table 8 shows the attitudes of policymakers and planners towards different transport
535 modes. A positive attitude means that most experts support the relevant transport modes, and a
536 negative attitude indicates that they oppose them. The results of practitioner interviews show
537 that policymakers and planners support travelling/commuting by walking, cycling and bus.
538 However, they oppose travelling by private cars and electric bicycles. Current transport policies
539 are designed to encourage use of active travel and public transport to reduce dependence on
540 private vehicles, as highlighted by policymakers and planners. In addition, they claim that
541 electric bicycles are difficult to control, and e-bikers often violate traffic rules in Heze.

542

543 **Table 8** Policymakers and planners' attitudes towards different transport modes

Transport mode	Policymaker	Planner
Car	×	×
Bus	√	√
Walking	√	√

Bicycle	√	√
Electric bicycle	×	×

Note: ‘ √ ’: positive; ‘×’: negative; ‘/’: neutral

4.2 Survey results

The analyses in this section focus on five categorical variables (gender, age, occupation, education and transport mode) and three scale variables (JES, STS and FS).

4.2.1 ANOVA

ANOVA is used to determine the significance between each categorical variable and each scale variable. If the five categorical variables are treated as independent variables and the three scale variables as dependent variables, a 5×3 matrix with significance values can be obtained from the ANOVA (Table 9).

Table 9 Significance values obtained from ANOVA

Variables	Journey Experience Scale	Satisfaction with Travel Scale	Flourishing Scale
Gender	0.579	0.598	0.691
Age	0.051	0.163	0.600
Occupation	0.258	0.717	0.989
Education	0.061	**0.015**	0.250
Transport Mode	**0.000**	**0.006**	0.081

The results show that three significance values are smaller than 0.05: those between transport mode and JES (0.000); between education and STS (0.015), and between transport mode and STS (0.006). Thus, the results indicate that transport modes relate to journey

experience; both transport mode and educational factors are related to hedonic well-being; and there is no relationship between each of the categorical variables and eudaimonic well-being.

4.2.2 MANOVA

MANOVA offers insight into the relationship and interaction effect between each combination of categorical variables and each scale variable. In this study, MANOVA can be used to analyse up to three categorical variables and one scale variable simultaneously. It is unnecessary, therefore, to explore the interaction effect between any two categorical variables and each scale variable. Table 10 displays the significance values between all combinations of three categorical variables and one scale variable. The results show five significance values less than 0.05: Item 4 and JES (0.000); Item 5 and JES (0.000); Item 5 and STS (0.006); Item 8 and JES (0.040); and Item 10 and JES (0.020).

Table 10 Significance values between combinations of three categorical variables and one scale variable

Item number	Combinations of categorical variables	JES	STS	FS
1	Gender, Age, Occupation	0.332	0.318	0.181
2	Gender, Age, Education	0.550	0.277	0.201
3	Gender, Age, Transport Mode	0.208	0.351	0.180
4	Gender, Occupation, Education	**0.000**	0.075	0.080
5	Gender, Occupation, Transport Mode	**0.000**	**0.006**	0.072
6	Gender, Education, Transport Mode	0.227	0.919	0.896
7	Age, Occupation, Education	0.272	0.458	0.709
8	Age, Occupation, Transport Mode	**0.040**	0.358	0.358
9	Age, Education, Transport Mode	0.331	0.737	0.864

10	Occupation, Education, Transport Mode	**0.020**	0.380	0.147

In section 4.2.1, the results from the ANOVA show that gender, age, occupation, and education are unrelated to journey experience, while the combination of gender, occupation and education in Item 4 can strongly affect JES as its significance value is less than 0.05. In addition, although JES may be affected by transport mode, and STS may be affected by transport mode and education respectively, combining other categorical variables with transport mode or education has no effect on JES or STS. For example, the significance value between Item 6 (gender, education, transport mode) and STS is 0.919, which is much larger than 0.05. Therefore, the interaction effect can affect the relationship between categorical variables and scale variables, and the interaction effect cannot be determined via the ANOVA. Section 4.2 reveals that some factors are related to the commuting experience and hedonic well-being (Table 11).

Table 11 The relationship between categorical variables and scale variables

Factors	Commuting Experience	Hedonic Well-being
Education	/	√
Transport mode	√	√
Gender, Occupation, Education	√	/
Gender, Occupation, Transport Mode	√	√
Age, Occupation, Transport Mode	√	/
Occupation, Education, Transport Mode	√	/

According to the results, eudaimonic well-being, measured by FS, cannot be influenced by any individual categorical variable or combination of multiple categorical variables. To determine whether these factors can influence eudaimonic well-being by affecting journey

experience and hedonic well-being, the next section explores the relationship between JES, STS, and FS.

4.3 Analysis of the relationship between journey experience, hedonic well-being, and eudaimonic well-being

To determine the relationship between the journey experience, hedonic well-being and eudaimonic well-being, the linear regression method and regression curve method were applied. Table 12 summarises the results of the three regressions. All three significance values are less than 0.05; thus, close relationships exist between the journey experience and hedonic well-being; between journey experience and eudaimonic well-being, and between hedonic well-being and eudaimonic well-being. Furthermore, all β_1 values in these three regressions are greater than 0; thus, every two variables in each linear regression have a positive correlation but differ on the degree of correlation and curve fitting. The multiple R value of the third regression has the highest value at 0.85, which means that the strongest positive correlation exists between hedonic well-being and eudaimonic well-being. Correspondingly, the R squared value of this regression (0.71) is the highest; thus, STS and FS fit the linear regression model best. In contrast, the weakest positive correlation exists between journey experience and eudaimonic well-being. Correspondingly, JES and FS are the worst fit for the linear regression model, with the lowest R squared value of 0.18.

Table 12 Multiple R and R squared values from the simple linear regression models

Regression	Axis	Variable	Significance	Slope	Intercept	Multiple	R	Regression curve

			value			R	squared	equation
1	Y X	STS JES	9.14437E-17	0.6745	-0.5435	0.56	0.31	Y = 0.6745X - 0.5435
2	Y X	FS JES	1.37099E-09	0.5166	37.144	0.42	0.18	Y = 0.5166X+37.144
3	Y X	FS STS	1.74901E-52	0.8522	37.403	0.85	0.71	Y = 0.8522X + 37.403

Overall, positive correlations exist between the commuting experience and hedonic well-being; between the commuting experience and well-being; and between hedonic well-being and eudaimonic well-being. Therefore, although none of the categorical variables or combinations is related to eudaimonic well-being, there are, nonetheless, factors that may be indirectly associated with eudaimonic well-being because they are directly related to the journey experience or hedonic well-being. The analysis presented in the previous section has suggested that the choice of different transport modes can affect the journey experience, hedonic well-being and eudaimonic well-being. The impacts of transport modes on journey experience and well-being are further examined below.

4.4 Impacts of transport modes on journey experience, hedonic well-being and eudaimonic well-being

Table 13 and Figure 2 display the average values of the three scale variables for different transport modes. To make the comparison clearer, the range of each FS item has been adjusted from 1~7 to -3~3. Five transport modes were analysed: cars, buses, walking, cycling, and electric bicycles. Compared with other transport modes, respondents who commuted by bicycle

were top scorers on all three scales, thus having the most satisfactory commuting experience and the highest levels of well-being. This concurs with Abou-Zeid and Ben-Akiva (2011) and Smith (2013), who found that commuters who cycle and/or walk were more likely to have higher levels of commuting satisfaction. Ma and Ye (2019) also claimed that cycling could produce more significant mental health benefits than walking. In contrast, commuting by car and electric bicycle scored the lowest average values, which is consistent with Ye and Titheridge's (2017) study, showing that electric bicycles are associated with the lowest levels of commuting satisfaction. Although the average values for buses and walking were not as high as for cycling, both have higher average values than cars and electric bicycles.

Table 13 Average values on the three scales for different transport modes

Variables	Transport modes				
	Car	**Buses**	**Walking**	**Cycling**	**Electric bicycles**
JES	3.07	5.24	5.27	14.77	5.11
STS	0.87	2.69	2.61	11.77	0.21
FS	38.28	41.55	39	45.07	37.01
FS (adjusted)	6.28	9.55	7	13.07	5.01

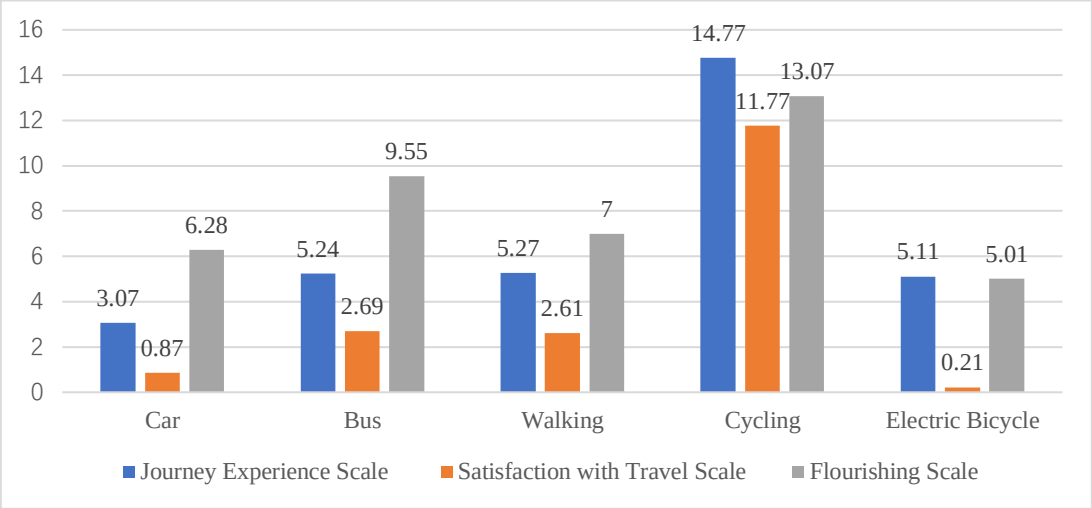

Fig. 2. Average scores on the three scales across different transport modes

5. Discussion

Our findings show that, first, commuting mode is related to the journey experience, while both educational attainment and commuting mode are related to hedonic well-being. Second, positive correlations exist between the commuting experience and hedonic well-being; between commuting experience and well-being; and between hedonic well-being and eudaimonic well-being. Furthermore, the strongest relationship is established between hedonic and eudaimonic well-being, while the weakest relationship is between the journey experience and eudaimonic well-being. Therefore, it can be argued that commuting mode is indirectly associated with eudaimonic well-being. Meanwhile, education has an indirect association with the journey experience and eudaimonic well-being. Previous studies conducted by Abou-Zeid and Ben-Akiva (2011), Ye and Titheridge (2017) and Zhu et al. (2019) illustrated the impacts of transport mode on journey experience and hedonic well-being. They argued that level of commuting satisfaction differs according to choice of travel mode. Existing research has shown that certain

individual characteristics, such as age, gender and occupation, can influence the journey experience and well-being (Oguz et al., 2013; Stradling et al., 2007; Zijlstra and Verhetsel, 2021). However, our study only shows an association between education and commuting experience, and hedonic and eudaimonic well-being. Ryff and Singer (2008) identified a strong positive link between educational attainment and eudaimonic well-being – a link particularly notable in relation to personal growth and life purpose. Zhu et al. (2019) and Zijlstra and Verhetsel (2021) found that the higher a person's level of educational attainment, the higher his/her levels of well-being. The results are also consistent with Ryan and Deci's (2001) views that hedonic well-being and eudaimonic well-being are complementary in some respects. McMahan and Estes (2011a; 2011b) asserted that the eudaimonic dimensions of well-being are more closely related to self-reported well-being and psychological functioning than the hedonic dimensions. This study explores the relationship between hedonic well-being and eudaimonic well-being, but also shows that the commuting experience is positively correlated with eudaimonic well-being.

Furthermore, the results have revealed that the journey experience is related to four combinations of variables: 1) gender, occupation and education; 2) gender, occupation and transport mode; 3) age, occupation and transport mode; 4) occupation, education and transport mode. However, according to our research, hedonic well-being is only related to the following combination: gender, occupation and transport mode. None of the combinations directly relates to eudaimonic well-being. Considering the interaction effect between relevant factors that impact on well-being, Zijlstra and Verhetsel (2021) argued that age, educational attainment and

other relevant variables are likely to affect the relationship between income and well-being.

Third, our results show that commuting by bicycle is associated with the highest levels of satisfaction with the journey experience and the highest levels of hedonic well-being and eudaimonic well-being, followed by walking. This is consistent with studies conducted by Abou-Zeid and Ben-Akiva (2011) and Smith (2013), showing that those who commute by bicycle and on foot are more likely to have higher levels of commuting satisfaction. Ma and Ye (2019) argued that cycling can offer greater mental health benefits than walking, while Cheng et al. (2020a) stated that walking is an important means of promoting health and well-being due to the benefits of an active lifestyle. Our results also show that respondents who commuted by bus tended to have higher levels of satisfaction with the commuting experience and higher levels of well-being compared with respondents who commute by cars and electric bicycles. Cao et al. (2016) maintained that public transport passengers have the highest levels of satisfaction with the metro, followed by BRT and conventional buses. However, Heze is a relatively small-sized city and buses are the only public transport option currently available. Therefore, with the advance of urban growth in Heze, the development of multiple public transport modes could improve citizens' well-being. In addition, well-developed public transport services could reduce private car usage and promote cycling (Meng et al., 2014). Commuting by car is generally associated with a relatively lower level of satisfaction with the commuting experience and of well-being, and this is likely to be exacerbated by the serious traffic congestion in Heze, which lengthens commuting time. Commuters who spend a longer time commuting tend to have lower levels of commuting satisfaction (Choi, Coughlin and

691 D’Ambrosio, 2013; Zhu et al., 2019; Zijlstra and Verhetsel, 2021). Additionally, our results
692 show that commuting by electric bicycle is associated with lower levels of satisfaction with
693 both the journey experience and lowest levels of hedonic and eudaimonic well-being.

694 Findings from practitioner interviews were generally consistent with survey findings. In
695 terms of commuting modes, active travel and travel by bus are perceived as more likely to
696 improve the quality of the journey experience and hedonic well-being. In contrast, commuting
697 by car and electric bicycle is regarded as reducing the quality of the journey experience and
698 hedonic well-being. However, our study has not identified a causal relationship between
699 commuting by bicycle, walking or bus and eudaimonic well-being. In addition, the individual's
700 conception of eudaimonic well-being leads him/her to undertake corresponding eudaimonic
701 activities. Furthermore, eudaimonic activities related to self-development and contribution to
702 society can result in positive subjective experiences and experiencing increased meaning in life,
703 resulting in higher levels of well-being (Diener and Lucas, 1999; Waterman, 2005). Our study
704 suggests that respondents with higher levels of eudaimonic well-being tend to walk, cycle or
705 travel by bus due to their conception of well-being; commuting on foot, by bicycle or by bus is
706 regarded as a positive eudaimonic activity, producing higher levels of eudaimonic well-being.
707 Based on the combined results of practitioner interviews and questionnaires, it is evident that
708 current transport issues in Heze, such as limited choice of transport modes (buses only), are
709 likely to lead to lower levels of satisfaction with the journey experience and lower levels of
710 well-being, while transport development opportunities, such as policies and planning designed
711 to promote and implement sustainable forms of transport, could improve quality of journey

712 experience and well-being. Therefore, the mixed methods approach effectively enables a better
713 linkage to be established between transport issues perceived by policymakers and transport
714 planners, and the demands of users (Liu et al., 2020; Lyu et al., 2020).

715 The results obtained from this case study can be compared with those for other cities. For
716 example, our findings echo what was found in Ye and Titheridge's (2017) research in Xi'an,
717 which showed that commuting mode influences both journey experience and hedonic well-
718 being, and commuting by electric bicycle is associated with the lowest levels of satisfaction in
719 these areas. In addition, Smith (2013) found that commuters in Portland who cycled and walked
720 have higher levels of commuting satisfaction than those who commute by other travel modes,
721 which corresponds with the results obtained from Heze. However, Zhu et al. (2019) examined
722 124 Chinese cities and found the opposite: those who commute by walking or cycling are likely
723 to experience lower levels of SWB. This could be due to the poor quality of pavements and
724 bicycle lanes, lack of safety measures, and traffic pollution.

725 Exploring transport mode's contribution to well-being is beneficial for policymakers
726 needing to meet increasing demands for social well-being and health rather than basing policy
727 merely on economic indicators (Singleton and Clifton, 2021). In this study, a new method
728 combining measurements of aspects of commuting experiences was used, in terms of hedonic
729 well-being and eudaimonic well-being, to explore commuting satisfaction. Measurements of
730 hedonic and eudaimonic well-being used in the commuting domain can also provide relevant
731 information for future development and management strategies. Combining the Satisfaction
732 with Travel Scale (STS) (Ettema et al., 2011) and the Flourishing Scale (Diener et al., 2010)

733 represents a new approach to measuring overall well-being, which contains elements of both
734 hedonic and eudaimonic well-being, thereby helping to achieve expectations for further studies
735 referred to by De Vos et al. (2013), as well as assisting practitioners and policymakers in
736 designing strategies to promote travellers' well-being and that of commuters in particular. It
737 might be argued that there is no significant difference between journey experience and hedonic
738 well-being (travel satisfaction) and that they could all be identified as travel satisfaction in
739 specific contexts. Several policy implications arise from our findings. First, walking and cycling
740 have been found to enhance the journey experience (Gatersleben and Uzzell, 2007; Legrain,
741 Eluru and El-Geneidy, 2015) and contribute to the hedonic (Abou-Zeid and Ben-Akiva, 2011;
742 Smith, 2013) and eudaimonic well-being (Vaitsis, Basbas and Nikiforiadis, 2019) of
743 commuters/travellers, in line with our results. Encouraging active travel to improve residents'
744 journey experiences and well-being is essential. Policy actions aimed at increasing active travel
745 should focus more on travellers' safety, comfort and route quality to reduce commuting stress
746 and increase travel satisfaction (Chatterjee et al., 2020; Vaitsis, Basbas and Nikiforiadis, 2019).
747 Therefore, local government sectors with responsibility for transport should extend and
748 accelerate the construction of infrastructure to facilitate and cater for active travel (e.g.,
749 pedestrian and cycle lanes). Cheng et al. (2019), Ma and Ye (2019) and Meng et al. (2014)
750 proposed similar methods, such as investing in dedicated cycle and pedestrian lanes, and
751 encouraging compact community design through connected streets and mixed land use.
752 Furthermore, bike-sharing systems can provide a flexible and convenient transport mode for
753 short trips, particularly for the first/last mile (Cheng et al., 2020b; Lyu et al., 2020; Zhang et al.,
754 2021; Zhang and Meng, 2019). Second, development of urban public transport within

comprehensive urban planning should be prioritised. Delays in commuting time result in unpleasant commuting experiences, reducing levels of hedonic well-being. Therefore, policy actions should focus on improving the service quality of public transport to reduce commuting time while increasing predictability (Chatterjee et al., 2020). Zhang, Wang and Meng (2018) claim that public transport development is one of the most effective ways to reduce urban traffic congestion. For instance, accelerating the construction of urban rail transit, bus lanes and BRT systems can provide an alternative to car travel in urban areas. Cao and Cao (2017) argue that transit operators should consider reliability of services and people's comfort while waiting at the station/stop. Third, alerting the public of green transport options can reduce private car usage, particularly in urban areas in relatively small cities. Transport demand management, such as restrictions on car purchases and restricted driving zones, could help reduce excessive car use and alleviate traffic congestion (Cao, 2021; Cheng et al., 2019). In short, policy implications should primarily focus on three aspects: enhancing the commuting experience (increasing predictability of public transport to reduce commuting stress and promoting an environmentally-friendly commuting environment); enhancing commuting satisfaction in terms of both hedonic and eudaimonic aspects (promoting active travel and improving the service quality of public transport); and reducing the negative impacts of long commutes (managing congestion and crowding and reducing car usage).

6. Conclusion

The relationship between commuting and well-being is a key issue in the field of mobility

776 and transport in both developed and developing countries. In the current literature, there is a
777 scarcity of research on the journey experience and eudaimonic well-being. This study, therefore,
778 examines commuters' experiences and both hedonic and eudaimonic well-being regarding
779 individual characteristics and transport mode, using Heze as a case study. The Journey
780 Experience Scale (JES), the Satisfaction with Travel Scale (STS) and the Flourishing Scale (FS)
781 have been applied to independently measure the journey experience, hedonic well-being and
782 eudaimonic well-being. Using the ANOVA and MANOVA methods, this study has explored the
783 significance values between the categorical variables (age, gender, education, occupation and
784 transport mode) and the scale variables (JES, STS and FS). The results show that educational
785 attainment is related to hedonic well-being, and transport mode is related to both the journey
786 experience and hedonic well-being. Furthermore, we found that some combinations of
787 individual characteristics and transport mode are related to the journey experience and hedonic
788 well-being, but none is related to eudaimonic well-being. Regression models were also applied.
789 We found strong positive associations between the commuting experience and hedonic well-
790 being; between the commuting experience and eudaimonic well-being; and between hedonic
791 and eudaimonic well-being. We also found that commuting by public transport, walking and
792 cycling are more likely to improve the quality of the journey experience as well as hedonic and
793 eudaimonic well-being.

794 It is highly salient for policymakers and transport planners to understand the relationship
795 between the journey experience and hedonic and eudaimonic well-being to formulate and
796 implement practical and forward-looking transport strategies and to balance policy outcomes

with residents' travel needs. Furthermore, individual characteristics and transport modes associated with travel behaviour have presented significant challenges in terms of urban planning and infrastructure development. Policies designed to promote travel satisfaction in the future should also focus on promoting active travel (walking and cycling) and public transport.

This study has limitations. First, the sample size is relatively small and could be increased in future studies. Second, some studies have recently explored the non-linear associations relating to travel satisfaction (Fang, et al., 2021; Sun, Fang and Cao, 2020; Wu, Cao and Ding, 2020). Therefore, in future research, non-linear models could also be applied to examine the relationship between the commuting experience and hedonic and eudaimonic well-being.

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