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Cycling for Sustainable Transportation in Urban Ghana: Exploring Attitudes and Perceptions among Adults with Different Cycling Experience

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Abstract

Attitudinal and perceptual factors are important determinants of bicycle use as a mode of transportation. Understanding how attitudes and perceptions vary across different population is critical for successful cycling promotion interventions. Drawing on research from the context of an African city, this paper examines attitudes and perceptions about utility cycling in the general population, and determines if there are differences in how males and females who have different cycling experience perceive cycling for commuting purposes. Using non-parametric test, the study found that attitudes and perceptions regarding the environmental, financial, exercise and potential health benefits of cycling for transportation were very positive generally, and slightly stronger in females who had never cycled before than in males in the same group. Cycling was also not perceived as the most comfortable, safe, easy, convenient and flexible mode of transportation suitable for long distance travel among the majority of the respondents. These perceptions and attitudes were pronounced in females in the sub-group of respondents who had never cycled before and those who cycled previously than in males in the same groups. Among frequent cyclists, males perceived cycling for commute as a less tiring activity than females. Moreover, cycling's public image as a less prestigious mode of transport that could not be taken to important social events was prevalent among the respondents, although this perception was found to be stronger in males than in females who had not cycled before. The findings could inform tailored cycling promotion programmes within the general population and across specific groups.

Keywords: cycling, active transport, attitudes, perceptions, sustainable transport, Kumasi

1. Introduction

The personal health benefits as well as the environmental and commuting advantages of utility cycling (cycling for transportation) are well documented. Regular intensity of cycling is considered an effective strategy to reducing inactive lifestyles towards improved health (Haskell, 2004; Titze et al., 2008; Van Dyck et al., 2013). Cycle ridership is also environmentally sustainable compared to motorized alternatives because of the low energy consumption and the absence of direct emission of pollutants such as green-house gases and noise (Gatersleben and Appleton, 2007). In terms of actual commuting benefits, the bicycle can offer affordable and reliable means of transport at a relatively faster speed over relatively longer distances, and can therefore cover many urban and sub-urban trips (Bonham and Koth, 2010; Heinen et al., 2010; Moudon et al., 2005; Shaheen et al., 2010).

Despite the many known benefits of cycling, bicycle mode share is still considerably low in many countries across the globe (Gatersleben and Appleton, 2007; Heesch et al., 2014). In recent years, cross-disciplinary research aimed at understanding the underlying motivations of people to adopt cycling for transportation have increased as part of efforts to promote bicycle ridership. These studies, conducted mainly in the context of European and North American cities, have applied social cognitive models such as the Theory of Planned Behaviour (Ajzen, 1985, 1991) to understand the fundamental psychological determinates of active transportation (i.e. walking and cycling) (e.g. Sun et al., 2015; Kaplan et al., 2015; Eves et. al., 2003; Bamberg et al., 2003; Quine, et al., 2007; Lajunen and Rasanen, 2004; de Bruijn et al., 2009) as well as socio-ecological models that integrate cognitive, socio-demographic, natural environment and built environment factors as

determinants of cycling behaviour (e.g. Heinen et al., 2010; Larsen and El-Geneidy; Mitra and Faulkne, 2012; Piatkowski and Marshal, 2015 Saneinejad et al., 2012; Willis et al., 2015).

A survey of the existing literature shows that variables measuring people's attitudes and perceptions tend to greatly increase the explanatory power of models used to understand and predict cycling behaviour (Heinen et al., 2011; Gatersleben and Appleton, 2007; Newman and Chorus, 2015; Piatkowski and Marshal, 2015). From the psychology literature, attitude refers to an individual's expectations of all the possible outcomes of an activity or behaviour and the personal values of these outcomes (Ajzen, 1991; Sutton et al., 2003). Thus, a person's attitude and perceptions about cycling for transportation reflect the degree to which s/he positively or negatively values the use of the bicycle. Attitudes have both instrumental and affective components. Instrumental attitude refers to a more cognitive consideration of the extent to which performing the behaviour (i.e. cycling) would be beneficial or advantageous, while affective attitudes reflect a person's feelings or emotions about the attitude object such as fear, fun or hate (French et al., 2005). Therefore, all other things being equal, the more favorable the attitude towards a behaviour, the stronger the individual's intention to perform it (Armitage and Connor, 2001; Ajzen, 1991).

Drawing on the theoretical proportions of Ajzen's theory of planned behaviour and socio-ecological models of behaviour change, several empirical studies have established that individual-level attitudes and perceptions have strong influence on bicycle use. For example, people who perceive cycling as form of exercise and identify flexibility of departure time as an important factor of mode choice are more likely to ride a bicycle (Akar and Clifton, 2009). Also, cyclists in general, do not prefer to ride in mixed traffic, with women generally more likely to cycle in environments they perceive as safe and with less motor vehicle traffic (Pucher et al., 2010). Using the transactional model of behaviour change, (Prochaska and DiClemente, 1984; Prochaska 1994), Gatersleben and Appleton (2006) show that attitudes towards a behaviour and behavior change is a process rather than event, and that as people progress from precontemplation to action, their attitudes towards cycling become more positive and their perceptions of various personal and external barriers change.

Understanding how attitudes and perceptions vary across different populations in different contexts is considered crucial to formulating and implementing tailored interventions to promote cycle ridership (Heinen et al., 2011; Hunecke et al., 2008). This is because, among different groups of cyclists, perceptions of the factors that are important to them may be different hence the need to make more subtle distinctions among different groups when examining attitudes and perceptions (Gatersleben and Appleton, 2006). For example, by comparing cycling behaviour of different groups of cyclists, Bergstrom and Magnusson (2003), found that winter cyclists valued exercise most whereas weather conditions were especially important for summer cyclists and travel time was most important for non-cyclists.

Although considerable amount of research exists on the attitudinal and perceptual aspects of urban cycling from the European and North American perspectives, only a handful of similar studies have been conducted within the context of African cities (e.g. Nkurunziza et al., 2012; Brussel and Ziidgeest, 2012). Also, as far as gender is concerned in cycling research, most analyses make broad comparisons, with few studies distinguishing between male and female cycling patterns separately (Heesch et al., 2012). Against this backdrop, this study aims to examine the attitudes and perceptions about cycling for transportation within the context of an African city. In line with previous studies that have shown clear differences in perceptions and attitudes among people with different cycling experiences (e.g. Ducheyne et al., 2012; Fernández-Heredia et al., 2014; Gatersleben and Appleton, 2007), the paper determines whether attitudes and perceptions towards cycling differ significantly between males and females and across different cycling experiences. The rationale is to contribute to the accretion of empirical evidence, which would provide the foundational knowledge, upon which tailored interventions could be designed to encourage more people to cycle in the city and across the continent.

2. Method

2.1 Study Area, Research Instruments Design and Data Collection

Field data for this study was obtained from Kumasi, the second largest city in Ghana, West Africa. The data used in this paper comes from a larger survey that was conducted to understand the cognitive factors underlying people's motivations and intentions to adopt cycling as mode of transport using Ajzen's Theory of Planned Behaviour (Ajzen, 1985, 1991). This paper isolates the data relating specifically to attitudes and perceptions, and delves deeper to examine whether males and females with different cycling experience perceived cycling for commute differently.

The study began with a pilot survey that was administered to a small convenient sample of 50 adults in the city, divided equally between males and females. The aim of the pilot survey was to understand how people viewed

cycling in general. To this end, an open-ended questionnaire was designed in which the study participants were asked to state what they thought the advantages and disadvantages of cycling would be to them as well as what they thought others perceived people who used the bicycle as a mode of transport in the city. To these questions, the study participants were asked to identify as many factors as they possibly could. The qualitative responses from the pilot survey together with insights obtained from the existing literature on cycling behaviour, informed the design of the main research instrument that was used to assess attitudes and perceptions about cycling in a bigger sample.

The main research instrument designed used a series of statements measuring attitudes and perception about cycling. A total of 20 closed-ended statements (See Table 1) were used to elicit people's attitudes and perceptions. These statements reflected the following five broad themes or concept groupings: (i) Personal health benefits of cycling. Example, *'exercise'*, *'reduce stress'* and *'good health'*; (ii) commuting benefits/ disadvantages of cycling. Example, *'affordability'*, *'flexibility'*, *'convenience'*, *'comfort' 'tiredness'* and '*bodily pains*'; (iii) perceived environmental benefits of cycling (iv) prestige and society's view of cycling as a mode of transportation in general and (v) others, representing all other attitudinal and perceptual factors that do not fit under any of the four previously defined themes.

In addition, the study participants were asked to indicate how much they agreed or disagreed with each statement on a five-point likert scale. Respondents were also asked to indicate their previous cycling experience out of four possible options namely; (i) 'never-cycled before'; (ii) 'used to cycle but have done so over the past two years'; (iii) 'currently cycle but do so occasionally' (i.e. do not cycle more than one day in one week); and (iv) 'cycle frequently' (i.e. Cycle three or more days in a week)". Lastly, background information about respondents including their gender, age and levels of educational attainment were also elicited.

Four proxy neighbourhoods namely; Bantama, Ayigya, Kentinkrono, and Ahodwo served as the points of empirical enquiry within the city. These communities were selected because they represent fairly well, the heterogeneity of people in the city in terms of location and socio-economic characteristics. Bantama is an indigenous inner-city, low-income neighbourhood. Ayigya, another low-income community is located within the inner-suburban zone of the city. Ahodwo on the other hand, is one of the high income neighbourhoods located in the city's inner-suburban zone while Kentinkrono exhibits the characteristics of a middle-to-high income neighbourhood located within the outer-suburban zone of the city.

A total of 500 adults, randomly recruited from these communities comprised the sample for the actual survey. For each of the proxy communities, a total of 125 questionnaires were administered to adults aged from 18 years who were at home as of the time of the survey and were willing to be interviewed. In order to have a good representation of the population, the surveys were conducted during the day and evening times on both weekdays and weekends. Respondents were either interviewed face-to-face by trained field assistants or could opt to self-complete the instrument in the presence of a field assistant provided they could read and write. Overall, about 20 percent of the questionnaires were self-completed.

2.2 Statistical Analysis

The survey responses were entered into SPSS for screening, processing and analysis. In line with the primary objective of the study to determine whether there are differences in perceptions and attitudes about cycling between males and females, the Mann-Whitney test, a non-parametric statistic was adopted. Non-parametric statistics in general, are appropriate for analyzing data that does not meet the assumptions of parametric test such as if the data are not normally distributed or if the data are measurements on an ordinal scale (McCrum-Gardner, 2008). The approach allows to overcome the problem of normal distribution of scores and eliminates the effect of outliers and skewness by ranking the data from lowest to highest; the analysis is then carried out on ranks rather than the actual data (Field, 2013).

The Mann-Whitney test was considered appropriate for this analysis because; (i) gender, which is the independent or grouping variable is dichotomous measured on a categorical scale (1 = Male, 2 = Female); (ii) the 20 items measuring attitudes and perception about cycling constitute the dependent variables, and are measured on ordinal scale; (iii) the aim of the test is to compare differences in attitudes and perceptions between the two independent groups—males and females. The statistical analysis was carried out at two main levels. First, differences in attitudes and perceptions between all males and females were examined irrespective of their cycling experience. The second level of the analysis involved examining differences between the two groups and across the four typology of cycling experience indicated by the respondents. Thus, the analysis tested the following null hypotheses:

- There are no differences in males and females as far as their cycling experiences are concerned;

- There are no differences in attitudes and perceptions about cycling for commute between males and females;
- There are no differences in attitudes and perceptions about cycling for commute between males and females who have never cycled before;
- There are no differences in attitudes and perceptions about cycling for commute between males and females who cycled previously but are currently not cycling;
- There are no differences in attitudes and perceptions of cycling for commute between males and females who cycle occasionally; and
- There are no differences in attitudes and perceptions of cycling for commute between males and females who cycle frequently.

In interpreting the Mann-Whitney test results, three key statistics are of interest as discussed in Field (2013). The first is the mean rank score for each group—males and females. Since Mann-Whitney test relies on scores being ranked from lowest to highest, the group with the lowest mean rank is the group with the greatest number of lower scores in it while the group with the highest mean rank have the greater number of high scores within it. The second statistic is z-score (z) which is the statistical measurement of a score's relationship to the mean score in a group. The effect size statistic (r) and the corresponding p-value (p) indicate whether the observed difference between the groups is significantly small, moderate or large. Following the criterion discussed in Field (2013), an effect size below 0.3 is small, between 0.3 and 0.5 is considered moderate while a figure above 0.5 represent large effect. The effect size is computed by dividing the z-score (z) by the square-root of the total observations (N).

3. Results

3.1 Sample Characteristics

The proportion of females (51percent) who completed the survey were similar to males (49percent). The study participants were aged between 18 and 65 years with an average age of 33 years (SD = 10.68). In terms of levels of educational attainment, 35percent of the participants had attained tertiary level of education, 43 percent had senior high school certificate, while the remaining 22 percent had attained basic level of education.

Each of the study participants selected one of four categories identifying their self-reported cycling experience. Thirty percent of them indicated that they had never cycled before, 44 percent cycled previously but had not done so for more than two years, 20 percent indicated that they only cycled occasionally while the remaining 6 percent indicated that they cycled frequently. Thus overall, 70 percent of the study participants had used the bicycle at some point in their lives. There was considerable difference between males and females as far as experience with cycling was concerned (U = 16559.500, z = -9.697, r = 0.43, $p<0.001$), with mean rank score for males (310.18) higher than that of females (192.69). This is reinforced by the finding that whereas only 11 percent of males indicated that they had never cycled before (N = 246), 49 percent of all females (N = 254) indicated that they had never cycled before. Given these differences in cycling experience, it would be expected that perceptions and attitudes about bicycle use would also differ between the genders.

3.2 Attitude and perceptions about cycling for transportation: Descriptive Analysis

The 5-point scale on which the study participants indicated their attitudes and perceptions about utility cycling was collapsed into 3 points. As shown in Table 1, indifference towards the measurement items were minimal as the majority of the responses were distributed between the polar ends of the scale (i.e. 'agree' and 'disagree').

Table 1. Descriptive statistics on respondents' attitudes and perception about cycling for transportation

Cycling Attitude and Perception Items	Response in Percentage (N=500)				
	Agree	Neutral	Disagree	Mean	SD
I. Personal health benefits					
Cycling would be a good source of exercise	84.8	3.0	12.2	1.27	.67
Cycling would promote good health	84.4	4.6	11.0	1.27	.65
Cycling would help me to reduce stress	60.8	8.2	31.0	1.70	.91
II. Commuting benefits/ disadvantages					
Cycling would be safe	36.4	11.8	51.8	2.15	.93
Cycling would be tiring	36.4	11.8	51.8	1.61	.88
Cycling would be cheaper than driving a car or using public transport	81.2	4.4	14.4	1.33	.71
Cycling would be convenient	33.8	9.2	57.0	2.23	.93
Cycling would be comfortable	27.2	8.8	64.0	2.37	.88
Cycling would let me get to places faster	51.0	5.2	43.8	1.93	.97
Cycling would be flexible compared to driving or using public transport	43.0	10.2	46.8	2.04	.95
Cycling would be fun and entertaining	48.4	7.6	44.0	1.96	.96
Cycling would make me sweat too much	84.2	3.4	12.4	1.28	.67
Cycling would be easy for me	33.8	4.8	61.2	2.27	.94
Cycling would result in body pains	58.4	9.0	32.6	1.74	.92
III. Perceived environmental benefits					
Cycling would be environmentally friendly (i.e. reduce pollution)	79.2	8.0	12.8	1.34	.69
IV. Prestige and society's view					
I believe cycling is perceived by most people as something done in rural areas	63.4	7.2	29.4	1.66	.90
I consider cycling as a less prestigious mode of transport	49.4	11.6	39.0	1.90	.94
I don't think I can cycle to very important social events	74.8	4.8	20.4	1.46	.81
V. Others					
I think I am too old to cycle	23.0	5.4	71.6	2.49	.84
I will cycle for transportation for longer distances distance to (more than 1 kilometer)	23.8	10.4	65.8	2.42	.85

Generally, the respondents' attitudes and perceptions with regards to the exercise and potential health benefits of cycling for transportation were very positive. Close to 85 percent of them agreed that cycling would be a good source of exercise and would promote good health. Similarly, the perception that cycling would be cheaper and environmentally sustainable mode of transport was very high among the population with 81percent and 79 percent of respondents, respectively agreeing with these assessments. Close to 61 percent of the study participants also believed that regular cycling could contribute to stress relief.

Moreover, a little over half (51.8 percent) of the respondents disagreed that cycling would be tiring while for the majority of the respondents (72 percent), age was not considered a barrier to adopting cycling as a mode of transportation. In fact, when asked to self-evaluate their levels of physical fitness, 61 percent of the respondents indicated that they were very physically fit to ride the bicycle while 34 percent rated themselves quite fit. In additions, 3 percent thought they were quite unfit physically while remaining 1 percent was indifferent as far as their level of physical fitness was concerned.

There were some negative attitudes and perceptions about cycling for transportation among the study participants. The majority of the respondents (84 percent) thought that too much sweating associated with riding the bicycle would not make its usage very pleasant. The public image of cycling as a mode of transport for rural

folks was considerably high, with 63 percent of the population agreeing with this statement. Also, nearly half (49.4 percent) of the participants perceived cycling as a less prestigious mode of transportation. It is therefore not surprising that nearly 3 in 4 of the adults interviewed agreed that they would not cycle to important social events. Also, a large proportion of the participants (65.8 percent) would not cycle over longer distances exceeding one kilometer. Over half of the population thought that cycling would result in bodily pains while a little over 60 percent of were of the view that it would not be easy for them to ride the bicycle. More than half of the respondents did not perceive cycling as a safe mode of transport. Perception of bicycle ridership adding fun to commute was rather divided among the population with 48 percent agreeing that cycling would be fun and 44 percent of the population indicating otherwise.

Attitudes and perceptions about the actual commuting benefits of cycling in terms of comfort, convenience, flexibility and speed were not all positive, and in some cases, views were divided among the population. Overall, 57 percent of the respondents disagreed with the statement that cycling would be a convenient mode of transport. Cycling was also not perceived as the most comfortable mode of transport among the majority of the population (64 percent). Perceptions about cycling as a fast mode of transport were mixed with 51 percent viewing it as a relatively fast mode of commute while 44 percent thought otherwise.

3.3 Comparing Attitudes and Perception between Genders and Across Cycling Experiences

Having examined the attitudes and perceptions about cycling in the overall sample population, the analysis proceeds to examine whether there is any statically significant difference between male and female respondents for each item using the Mann-Whitney test. Firstly, differences are examined between all males and females for each of the statements measuring their perceptions and attitudes. Next, the analysis differentiates between attitudes and perceptions of males and females, belonging to the four groups of cycling experiences identified.

3.3.1 Attitudes and Perceptions of Males and Females Regardless of Cycling Experience

The summary of the Mann-Whiney test comparing cycling attitudes and perceptions between males and females regardless of their cycling experience is presented in Table 2. The analysis tests the null hypothesis that there are no differences in attitudes and perception about cycling for commute between males and females. The results show a significant difference between males and females for all the attitudinal and perceptual measurement items expect for two of them. These are the statements 'cycling would make me sweat too much' (p = 0.49) and 'I belief cycling is perceived by most people as something done in rural areas (p = 0.23).

Table 2. Attitudes and perceptions about cycling in males and females regardless of cycling experience

	Mann-Whitney Statistics (N = 220)			
Cycling Attitude and Perception Items	*U*	Z	R	Sig
I. Personal health benefits				
Cycling would be a good source of exercise	28733	-2.49	-0.11	.013*
Cycling would promote good health	26644	-4.52	-0.2	.000*
Cycling would help me to reduce stress	25732	-3.95	-0.18	.000*
II. Commuting benefits/ disadvantages				
Cycling would be safe for me	20937	-7.08	-0.32	.000*
Cycling would be tiring	26885	-3.25	-0.15	.001*
Cycling would be cheaper than driving a car or using public transport	29081	-1.97	-0.09	.049*
Cycling would be convenient	22097	-6.43	-0.29	.000*
Cycling would be comfortable	22538	-6.36	-0.28	.000*
Cycling would let me get to places faster	26744	-3.15	-0.14	.002*
Cycling would be flexible compared to driving or using public transport	23500	-5.30	-0.24	.000*
Cycling would be fun and entertaining	25722	-3.82	-0.17	.000*
Cycling would make me sweat too much	30537	-0.69	-0.03	.490
Cycling would be easy	20806	-7.49	-0.34	.000*
Cycling would result in body pains	21549	-6.86	-0.31	.000*

III. Perceived environmental benefits				
Cycling would be environmentally friendly (i.e. reduce pollution)	28304	-2.57	-0.11	.010*
IV. Prestige and society's view				
I believe cycling is perceived by most people as something done in rural areas	29592	-1.20	-0.05	.228
I consider cycling as a less prestigious mode of transport	25244	-4.10	-0.18	.000*
I don't think I can cycle to very important social events	25080	-5.04	-0.23	.000*
V. Others				
I think I am too old to cycle	26413	-3.80	-0.17	.000*
I will cycle for transportation for longer distances distance to (more than 1 kilometer)	23672	-5.60	-0.25	.000*

Notes: U = Mann-Whitney test values; Z = z-score, R = effect size; * p-value <0.05 (2-tail)

The effect size of the attitudinal and perceptual items that were statically significant ranged between small and moderate. The difference between males and females, about the widely held positive attitude and perception was statically significant but considerably small for the potential exercise (U = 28733, z = -2.49, r = -0.11 p = 0.013); health (U = 26644, z = -4.52 r = -0, 2, p < 0.001) and stress reducing (U = 25732, z = -3.95, r = -0.18 p < 0.001) benefits of cycling for transportation respectively. The mean rank for all three health-related attitudinal measures with respect to cycling was just marginally higher in females than in males. This means that among the total sample population, attitudes about the health-related benefits of cycling were slightly stronger in females than in males.

Moreover, there was a statistically significant moderate difference in perceptions between males and females that cycling would be a safe mode of commute or otherwise (U = 20937, z = -7.08, r = -0.30, p < 0.001). On this item, the mean rank for females (291.07) was higher than males (208.61), implying that within the population, the widely held belief that cycling would not be a safe mode of transport was stronger in females than in males. Similarly, the difference in perception of cycling being easy/difficult between males and females was moderate and statistically significant (U = 20806, z = -7.49, r = -0.34, p < 0.001). With the mean rank for females (290.59) higher than males (207.92), and given that about 61.2percent of the population disagreed that cycling would be easy, it implies that the perception that cycling would be difficult to undertake was stronger in females than in males. On the contrary, when it comes to the widely held belief that cycling would result in bodily pains, perception in males (mean rank = 289.90) was stronger than in females (mean rank = 212.34); the size of the effect was moderate and statistically significant (U = 21549, z = -6.86, r = -0.31, p < 0.001).

Furthermore, the differences in attitudes and perceptions between males and females regarding the actual commute benefits of cycling was near moderate in term of convenience (U = 22097, z = -6.43, r = -0.29, p < 0.00) and comfort (U = 22538, z = -6.36, r = -0.28, p < 0.001). The observed distribution of participants' response in which more than half disagreed that cycling was a convenient mode of commute that would afford comfort was just slightly higher in females than in males based their respective mean rank scores. In terms of the perception of speed and flexibility, for which the observed responses were divided between 'agreed' and 'disagreed', the effect size between males and females was small, though statically significant. On both items, the mean ranks for males and females were similar. The observation among the majority of the population that cycling would not be suitable for long distance commute was significantly different between males and females (U = 23672, z = -5.60, r = -0.25, p < 0.00): the mean rank for females (280.31) and that of males (219.73) imply that this perception was stronger in the former than in the latter.

In addition, the widely held view that cycling was a less prestigious mode of transport and that it would not be a suitable mode of transport to important social events differed significantly between males and females although the effect sizes were small (U = 25244, z = -4.10, r = -0.18, p < 0.001; and U = 25080, z = -5.04, r = -0.23, p < 0.001, for prestige and social events respectively). Based on mean rank scores, the test shown that these perceptions were slightly stronger in males than in females. This could be due to the perception that when it comes to modes of transport particularly private cars, men would ride in the most fashionable vehicles in order to impress. Thus, the bicycle perhaps, looks less fashionable and prestigious as a mode of transport to males than to females.

3.3.2 Attitudes and Perceptions of Males and Females Who Have Never Cycled before

The next level of comparison tests the null hypothesis that there are no differences in attitudes and perceptions about cycling for commute between males and females who have never cycled before. Within this group (N = 152), females were over-represented (82 percent). The analysis showed that out of the 20 items measuring attitudes and perception about utility cycling between the genders, only 9 of them yielded statistically significant results (see Table 3). Among the perceived health benefits of cycling, the differences between male and females within this group, with respect to the perceived stress reducing benefits of cycling was statistically significant (U = 1319, z = -1.98, r = -0.16, p =.047). The size of the effect was small, with mean rank for females (79.45) slightly higher than that of males (68.41).

Table 3. Attitudes and perceptions about cycling in males and females who have never cycled before

	Mann-Whitney Statistics (N = 220)			
Cycling Attitude and Perception Items	*U*	Z	R	Sig
I. Personal health benefits				
Cycling would be a good source of exercise	1592	-.60	-0.05	.547
Cycling would promote good health	1469	-1.31	-0.11	.190
Cycling would help me to reduce stress	1319	-1.98	-0.16	.047*
II. Commuting benefits/ disadvantages				
Cycling would be safe	1089	-3.66	-0.30	.000*
Cycling would be tiring	1530	-.98	-0.08	.326
Cycling would be cheaper than driving a car or using public transport	1580	-.67	-0.05	.505
Cycling would be convenient	1230	-2.80	-0.23	.005*
Cycling would be comfortable	1159	-3.40	-0.28	.001*
Cycling would let me get to places faster	1301	-2.12	-0.17	.034*
Cycling would be flexible compared to driving or using public transport	1355	-1.82	-0.15	.069
Cycling would be fun and entertaining	1389	-1.61	-0.13	.107
Cycling would make me sweat too much	1646	-.35	-0.03	.724
Cycling would be easy	1208	-3.44	-0.28	.001*
Cycling would result in body pains	1106	-3.74	-0.30	.000*
III. Perceived environmental benefits				
Cycling would be environmentally friendly (i.e. reduce pollution)	1455	-1.38	-0.11	.167
IV. Prestige and society's view				
I believe cycling is perceived by most people as something done in rural areas	1556	-.79	-0.06	.430
I consider cycling as a less prestigious mode of transport	1142	-3.15	-0.26	.002*
I don't think I can cycle to very important social events	1129	-4.12	-0.33	.000*
V. Others				
I think I am too old to cycle	1575	-.62	-0.05	.535
I will cycle for transportation for longer distances distance to (more than 1 kilometer)	1531	-1.09	-0.09	.277

Notes: U = Mann-Whitney test values; Z = z-score, R = effect size; * p-value <0.05 (2-tail)

As with the overall sample population, the perception that cycling would not be a safe mode of transport was stronger in females (mean rank = 81.29) than in males (mean rank = 54.31) within the sub-group of respondent who had never cycled: the size of the effect was moderate (U = 1089, z = -3.66, r = -0.30, p <0.001). The association of cycling with body pains was also significantly different between genders in this group. The effect size was moderate while this view was pronounced in males than in females (U = 1106, z = -3.74, r = -0.30, p

<0.001) as was the case with the total sample population. Similar results were derived with respect to the perception that cycling was a less prestigious mode of commute (U = 1142, z = -3.15, r = -0.26, p = 0.002) that was not considered suitable for important social events (U = 1129, z = -4.12, r = -0.33, p <0.001). These perceptions were stronger in males than in females based on higher mean rank for the former than the latter.

The differences in attitudes and perceptions between males and females regarding the actual commute benefits of cycling was again, near moderate with respect to convenience (U = 1230, z = -2.80, r = -0.23, p = .005) and comfort (U = 1159, z = -3.40, r = -0.28, p = 0.001). Based on mean ranks, it was found that the widely held perception that cycling would not be a convenient and comfortable mode of transport was stronger in females than in males who had never cycled before. Finally, the perception that cycling would be difficult was also stronger in females than in males (U = 1208, z = -3.44, r = -0.28, p = 0.002), with the size of the effect near moderate.

3.3.3 Attitudes and Perceptions of Males and Females Who Used to Cycle Only

The third level of the analysis tests the hypothesis that there are no differences in attitudes and perceptions about cycling for commute between males and females who cycled previously but are not currently cycling. The total sample in this sub-group was 220 with 56 percent being male and the remaining 44 percent being females. The Mann-Whitney test shown that within this sub-group, 7 out of the 20 items measuring attitudes and perceptions about cycling for commute yielded statistically significant results (see Table 4).

Table 4. Attitudes and perceptions of males and females who used to cycle

Cycling Attitude and Perception Items	**Mann-Whitney Statistics** (N = 220)			
	U	Z	R	Sig
I. Personal health benefits				
cycling would be a good source of exercise	5736	-.754	-0.05	.451
cycling would promote good health	5436	-1.905	-0.13	.057
cycling would help me to reduce stress	5648	-.743	-0.05	.458
II. Commuting benefits/ disadvantages				
Cycling would be safe	4951	-2.416	-0.16	.016*
Cycling would be tiring	5575	-.997	-0.07	.319
Cycling would be cheaper than driving a car or using public transport	5930	-.072	0.00	.943
Cycling would be convenient	4638	-3.139	-0.21	.002*
Cycling would be comfortable	4516	-3.652	-0.25	.000*
Cycling would let me get to places faster	5535	-.999	-0.07	.318
Cycling would be flexible compared to driving or using public transport	4657	-3.064	-0.21	.002*
Cycling would be fun and entertaining	5345	-1.452	-0.10	.146
Cycling would make me sweat too much	5744	-.725	-0.05	.468
Cycling would be easy	4544	-3.490	-0.24	.000*
Cycling would result in body pains	4731	-2.952	-0.20	.003*
III. Perceived environmental benefits				
Cycling would be environmentally friendly (i.e. reduce pollution)	5841	-.337	-0.02	.736
IV. Prestige and society's view				
I believe cycling is perceived by most people as something done in rural areas	5903	-.122	-0.01	.903
I consider cycling as a less prestigious mode of transport	5920	-.076	-0.01	.940
I don't think I can cycle to very important social events	5336	-1.857	-0.13	.063
V. Others				
I think I am too old to cycle	5700	-.684	-0.05	.494
I will cycle for transportation for longer distances distance to (more than 1 kilometer)	5141	-2.111	-0.14	.035*

Notes: U = Mann-Whitney test values; Z = z-score, R = effect size; * p-value <0.05 (2-tail)

Firstly, the widely held perception within the population that cycling for transportation would not safe was stronger in females (mean rank = 120.93) who used to cycle than in males (mean rank = 102.43) in the same group ($U = 4951$, $z = -2.416$, $r = -0.16$, $p = 0.016$). Similarly, the perception among the population that cycling is would not offer convenience, flexibility and comfort as a mode of transport was more pronounced in females than in males in the sub-group of respondents who used to cycle but are currently not doing so. On the convenience item, the mean rank score for females (124.19) was higher than males (99.90) ($U = 4638$, $z = -3.14$, $r = -0.21$, $p = 0.002$). Similarly, in terms of perception about flexibility the mean rank score for females (123.99) was higher than males (100.06) ($U = 4657$, $z = -3.06$, $r = -0.21$, $p = 0.002$). In addition, the mean rank score for females (125.46) was higher than that of males (98.82) on their perception about comfort with respect to cycling ($U = 4516$, $z = -3.65$, $r = -0.25$, $p = 0.002$).

Also, the difference between the sexes within this sub-group was statistically significant in terms of their perception of how easy/difficult cycling would be to them as well as their association of bodily pains with regular cycling. The widely held view that cycling would not be an easy activity to perform was stronger in females (mean rank score = 124.17) than in males (98.94); the size of the effect was near moderate ($U = 4544$, $z = -3.49$, $r = -0.24$, $p < 0.001$). On the contrary, the perception of that cycling would result in bodily pains was stronger in males (mean rank score = 120.35) than in females (mean rank score = 97.79), with the size of the effect being small ($U = 4731$, $z = -2.95$, $r = -0.20$, $p = 0.003$).

3.3.4 Attitudes and Perceptions of Males and Females Who Cycle Occasionally and Frequently

The last two stages of the analysis involved examining differences in attitudes and perceptions about cycling for the sub-group of the population who cycled occasionally (n = 99) and those who cycled frequently (n = 29). Among the sub-group of respondents who cycled occasionally, 70percent were males while the remaining 30percent were females. Among the sub-group of frequent cyclist, there were more males (86percent) than females (14percent).

Firstly, the null hypothesis that there are no differences in attitudes and perceptions about cycling for commute between males and females who cycled occasionally was tested. The results indicated that the means ranks for males and females in this sub-group were similar for each of the 20 items measuring attitudes and perception. While the effect sizes were very small between genders (i.e. between 0.011 and 0.14), none of the tests yielded a statistically significant difference in attitudes and perception about cycling for this of sub-group respondents.

Last but not least, the analysis proceeded to test the null hypothesis that there are no differences in attitudes and perceptions about cycling for commute between males and females who cycle frequently. Only the test on differences between males and females regarding the widely held perception among the respondents that cycling would not be tiring was statistically significant. The mean rank for males (16.42) was significantly higher than females (6.13), and the size of the effect was near large ($U = 15$, $z = -2.50$, $r = -0.46$, $p = 0.020$). This means that among frequent cyclist, males perceived cycling for commute a less tiring activity than females.

4. Discussion and Policy Implications

This study has examined the differences in attitudes and perceptions about cycling for transportation between males and females based on empirical data obtained from adults in four proxy neighbourhoods in Kumasi, Ghana. Attitudes and perceptions within the population were assessed using 20 items that reflected the potential health benefits and actual commute advantages of cycling as well as the public image of cycling as an alternative mode of transportation. The study also identified the levels of cycling experience within the sampled population. It found that less than one-third of the study participants had never cycled before. The number of females who had never used the bicycle at some point in their lives was about four-times higher than their male counterparts. This finding is consistent with other studies that found that men are more confident and more likely to cycle with greater frequency than women (Heinen et al., 2010; Dill and McNeil, 2013; Dickinson et al., 2003; Beecham and Wood, 2014). With this information, attitudes and perceptions about cycling were first examined within the total sample population. The analysis was then taken further by examining how attitudes and perceptions about utility cycling varied between males and females who had different levels of cycling experience.

Overall, respondents' attitudes and perceptions regarding the exercise and potential health benefits of cycling for transportation were very positive. Attitudes about the health-related benefits of cycling were only slightly stronger in females than in males for the overall sample and among the sub-group of people who had never cycled before: the size of the observed effect ranged between small to near moderate. There were however no statistically significant differences between the genders as far as the perceived health-related benefits of cycling was concerned within the sub-group of respondents who used to cycle but had not done so for the past two years, those who cycled occasionally, and those who cycled frequently. Similarly, the belief that the use of the bicycle

would be cheaper and environmentally sustainable mode of transportation was shared by a significant segment of the study participants. For the majority of the population, age was not considered a barrier to adopting cycling for transportation. This was reinforced by the finding that a significant share of the population considered themselves physically fit to ride the bicycle.

In general, perceptions about cycling being a less prestigious mode of transport, and the public image of cycling as being a mode of transport for people living in rural areas was considerably high among the population. Consequently, 3 out of 4 of the respondents indicated that they would not cycle to important social events. This perception was found to be stronger in males than in females within the sub-group of respondents who had never cycled before, with the size of the effect being moderate. This could be due to the perception that when it comes to modes of transport particularly private cars, men would ride in the most fashionable vehicles in order to impress. Thus, the bicycle perhaps looks less fashionable and prestigious as a mode of transport to males than to females. Some studies support this finding at least partially. For example, research conducted in different Australian cities found that societal issues including prestige association with different modes of transport was one of significant barriers to the uptake of cycling (Rissel et al., 2008). Also, Nkurunziza and van Maarseveen (2013), indicate that the sense of prestige attached to cycling decreases as people age. In their study of transitions in cycling behaviour in Dar-es-Salaam, Tanzania, they found that the majority of their respondents started to cycle around primary school age; at this age, the found that cycling provides prestige and is considered to be fun. In the current study however, there was no statistically significant differences between the genders on cycling's public image among the sub-group of respondents who had cycled previously, occasionally or frequently.

Moreover, cycling was not perceived as the most comfortable, safe, easy, convenient and flexible mode of transportation suitable for long distance travel among the majority of the sample population. Opinions about the advantages of cycling in terms of the relative speed it offers during commute were however mixed. These beliefs, attitudes and perception about cycling for commute were in general, stronger in females than in males within the total sample population and among the sub-group of respondents who had never cycled before and those who used to cycled but had not done so over the past two years. Among those who cycled frequently, males perceived cycling for commute as a less tiring activity than females. Similar differences were not observed between the genders among the other sub-groups of cycling experience. Previous studies (Emond et al., 2009; Garrard et al., 2008; Heinen et al., 2010; Heesch et al., 2012) among other things, found similar differences in attitudes and perceptions of constraints to cycling between males and females. Taken together, these perceptions could be due to the fact that disproportionately larger number of males had cycling experience compared to females. Thus, since females cycled less or did not cycle at all, they are more likely to perceive it as a less safe mode of transport and a difficult activity to perform physically than their male counterparts. On the contrary the association of cycling with bodily pains, was stronger in males than in females. The fact that more men than women cycled either previously or currently could explain this.

The findings of the study have a number of policy implications. Firstly, the very positive attitudes among the overall population with respect to the personal health and environmental benefits of cycling, and the view that cycling would be relatively cheaper could provide enormous opportunity for getting more people to adopt cycling for transportation in the city. Also, cycling promotion interventions could be anchored on the fact that the majority of the study population have had some experience with cycling at some point in their lives. Notwithstanding these opportunities, interventions aimed at promoting bicycle ridership among the population would have to dedicate substantial effort in dealing with cycling's negative public image among the population. Such campaigns could for example, project the health, economic and environmental beliefs about cycling held among the population as a way of dealing with the negative perceptions and attitudes. Although targeting both genders would be necessary in ensuring successful cycling promotion campaigns, policy makers should be mindful that attitudes and perceptions are not the same among males and females, and that tailored interventions would be necessary.

Moreover, research has shown that people are more likely to cycle in environments they perceive safe (Chataway et al., 2014; Heesch et al., 2012; Lawson et al., 2013; Larsen and El-Geneidy, 2010; Titze et al., 2008; Kaplan and Prato 2014). In view of this, investing in bicycle infrastructure such as dedicated bicycle lanes, traffic calming measures, street lightening and bicycle shelters at the neighborhood and city scales would help secure the conducive environment for people to cycle. Also, cyclists are known to perceive safety in numbers and that peoples' decision to cycle may be influenced positively if they see significant others cycle (Dill and Voros, 2007; Johnson et al., 2014). Therefore, efforts aimed at getting more people to cycle could include the formation of cycling clubs, for example, at work-places, within neighbourhoods and on university campuses as a way of institutionalizing a culture of cycling and getting large numbers of people to adopt cycling. With well-tailored

programmes, negative attitudes and perceptions about utility cycling could be minimized in the population leading to increased awareness and possible adoption of the bicycle as sustainable mode of urban transportation.

Despite the strengths of and empirical insights derived from this study, it has some limitations. Firstly, although the perceptual and attitudinal factors of respondents were assessed with respect to utility cycling as opposed to recreational cycling, the study did not explicitly include trip purposes. Given that travel purpose—whether for work or non-work related reasons could have significant influence on peoples' choice of cycling, this question warrants addressing in future research. Also, in order to establish differences in cycling behaviour across different neighbourhoods, it would be useful for future research to explicitly capture built environment attributes and how they might influence bicycle ridership.

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