

THE BUILT ENVIRONMENT AND TRAVEL MODE CHOICE BEHAVIOUR INFLUENCE ON CHILDREN'S INDEPENDENT MOBILITY IN THE MILITARY BARRACKS OF NIGERIA

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Abstract

To adequately engage children in an active lifestyle, a reversal of the decline in independent mobility is vital. Integrating a child-friendly environment and active travel behaviour is a pre-requisite to reverse the trend that has received little or no attention in the barracks of Nigeria. It is essential for children's physical, mental, spiritual and social development that contributes to their quality of life. This study appraised the built environment and travel behaviour studies towards enhanced conceptual framework for children's independent mobility. It reviewed existing literature in interdisciplinary studies over eight decades to identify policy gaps. Besides, the five barrack environment characteristics and six travel behaviour factors predicted with four indicators. The predicted model explained variances that produced an R^2 value of 0.35 at 0.00 significant p-values. It is useful for policy formulation of improved independent mobility of children in the barrack, housing estates and compact cities across Africa, especially in Nigeria.

Keywords: Military barracks; Child-friendly Environment; Travel choice behaviour; Independent mobility.

1. INTRODUCTION

Understanding the background and peculiarities of military barracks in Africa, especially in Nigeria, is vital in the study of its built environment and travel behaviour towards children's independent mobility. Many countries including British started accommodating soldiers in rented homes and hotels with the civilian populace. The trend continued until it became insufficient for their living and needs. Moreover, it became difficult to enforce control, maintain discipline, curb absence without official leave and desertion of troops. Thus, the first barracks constructed was in British 1713 and England in 1721. Subsequently, Berwick Barracks became England's first infantry barracks designed by Mr Nicholas Hawksmoor in the 18th century. Barracks varied in size and design, but they were typically organized around a barrack square usually overcrowded with troops allocated only 200-300 cubic feet of space per man. Thus, it could be said that the original idea of the military's place in society evolved from Western experience. It emphasized the organisational separation of the military from the rest of the community due to its role in national Defence and security, which varies in developed and developing countries. Consequently, contemporary security issues such as ethnoreligious, economic, political crisis and human insecurity became a considerable challenge in both developed and developing countries, including Nigeria. It also included internal security problems such as militancy, insurgency and kidnapping that necessitated the maintenance of a

large military population and barracks in developing countries, especially in Nigeria. Although the strength of the military is usually determined by order of Battle (ORBAT) which also depends on countries' national interest and foreign policies. Today, barracks have occupied large spaces in developed and developing countries.

The military barrack surrounding culture, house and neighborhood often describes the environmental condition and multicultural environment in which people lives and carry out daily activities. It shapes the resident and surrounding settlement, especially the children living in the barracks of an urban setting. Therefore, to promote the independent mobility of children in a child-friendly barrack, this study reviewed articles on built environment and travel behaviour relationships. Studies in the developed countries and few published, as well as unpublished articles in developing countries, were consulted. Notably, researches on the connection between the built environment and travel dated back to the 1950s as published by Mitchell and Rapkin (1954). An effort has been devoted to developing integrated land use and travel models, particularly in the 1960s and 1970s. From the policy viewpoint, mixed land use, high density and the provision of public travel mode were believed to be more effective in containing travel demand and reducing motorised dependence, air pollution and energy consumption. Since the 1990s, some studies have explored associations between built environment and travel behaviour (Newman and Kenworthy, 1999; Handy, 1996; Crane, 2000; Cervero, 2002), but not linked to the policy framework for improved children's independent mobility. Built environment investigated dwelled on land use or jobs-housing relationship as provided in a summary of finding by Ewing and Cervero (2001). It explained individuals' travel behaviour as a significant factor of mode choices and a determinant of trip frequencies complementing socio-economic characteristics. In which case, high-density housing developments and mixed land-use environment were found to be associated with shorter trips and a higher degree of walking and cycling. However, it left a gap for consideration on land use measures and urban planning strategies to promote independent walking by children, which is a matter of concern in this review and specifically to the military barracks of Nigeria.

Meanwhile, the child-friendly built environment has been adjudged to be an essential prerequisite for children's physical, mental, spiritual and social development (UNICEF, 1989). Thus, what makes a child-friendly built environment was explained in past studies (Kytta, 2004; Horelli, 2007; Nordström, 2010). Similarly, Broberg et al. (2013b) viewed child-friendly built environment based on two criteria. It included the possibilities for children's freedom to travel around without an adult's supervision and their opportunities to actualise environmental affordances (Kytta, 2015). This review considered the built environment characteristics and travel mode choice behaviour that promote or hinder children independent mobility. The finding is expected to contribute to the existing body of knowledge on children independent movement and association between the built environment and travel behaviour. The built environment encompasses human-made features in a place often characterised by density, diversity, design, distance and destination accessibility usually denoted with 5Ds. The density can be measured using population, residential density, and floor area ratio. However, children independent mobility indicators can be measured objectively by geographical range, the time allowed freedom outside the home, destinations accessibility, land-use, and negotiated a degree

of parental license (Kytta, 2004; Loebach and Gilliland, 2014; Villanueva et al., 2012). Creating independent mobility indicators helps to predict a concept of improved children's independent mobility in the military barrack. Studies on the association between built environment and children independent movement have shown a significant drop in the level over the last few decades. This was attributed to the high rate of obesity in children (Whitzman et al., 2010) and a sense of fear (Prezza and Pacilli, 2007). Thus, the physical and cognitive incompetency with a poor understanding of the environment have reduced opportunities for recreational and social life (Rissotto and Tonucci, 2002). In Australia, for instance, there has been a reduction in the independent mobility of children from 61% to 32% in 1991 to 2012, it varies according to the geographical location of study.

Moreover, the study on children's environment and travel behaviour has attracted multiple research disciplines in the built environment, transportation, social sciences, health and place as well as military architecture. Many of the researches revealed that children's mobility pattern had been altered worldwide due to rapid urbanisation with far-reaching effect on built environmental and socio-economic transformation. Consequently, the complicated relationship between built environment and children independent mobility has been on the increase since it was first reported in the early 1980s by Van Vliet (1983). To this extent, built environment factors such as availability and proximity of destinations, land use diversity and density, street connectivity impacts on children independent mobility have been found useful in policies, but limited in the study. However, only a few of the reviews showed a consistent relationship between several built environment factors and children independent movement. Notably, consistency in terms of direction and degree of connectedness varies in the studies supported by Broberg and Sarjala (2015) that a negative correlation exists between children independent mobility and land use mix in Finland compared with Bangladesh (Islam et al., 2014). Studies have also reported that a strong relationship exists between well-connected street networks and children independent mobility (Braza et al., 2004; Kerr et al., 2006). In contrast, it was found that the less-connected road network dead-end streets are more likely to increase children independent mobility. These contradictions and ambiguity in research findings raise the question about the real effect of the built environment on children independent movement. However, there has been a shortage of studies that systematically and statistically investigated these inconsistencies over time. Instead, studies have mainly focused attention on the link that exists between children's independent mobility and health benefits as an explanatory factor. Therefore, this review summarised the current body of knowledge on the association between the built environment and travel mode choice behaviour towards improved children independent mobility. It is also a lesson towards promoting child-friendly military barrack community in Nigeria. The findings would contribute a policy guide to design and urban renewal program to achieve the UN sustainable goals on children's environment and development.

Moreover, many previous studies have looked into the built environment factors that influence decision-making and travel mode choice behaviour between parents and children qualitatively. The built environmental were factorised into 3Ds, 5Ds 6Ds. They were influenced by functional areas of the distance between places, street design and geometry. The connectivity

of streets, path infrastructure, aesthetic qualities, safety, the mix of land uses, the proximity, and variety of destinations inclusive. Besides, built environment factors were related to different types of walking activities in ways other than recreation. The study showed that the provision of proper infrastructure takes care of gender differences in home school journey. Notably, household's scheduling of activities and parent's travel to work influences children's choice of walking or cycling to school. A US study showed significant relationship with their mother's trip to work. In contrast, the research in New Zealand by Lang et al. (2011) revealed that parents make an option to drive their children to school irrespective of the proximity to the school. But the perceived comfort of motorised travel was a challenge. Again, in Austin, Texas parent influences their child's walking to and from school. Kerr et al. (2007) in the study at the US showed significant relationships of children walking to school. It was in spite of ethnic and socioeconomic variations in households and built environment factors that exist. The rationalisation and merging of schools in response to local enrolment policies and change in status brought about social cohesion and community identity (Witten et al., 2001), which impacted parental behaviour. It is clear from the studies that both the built environment and socio-demographic and behavioural factors influence children's travel mode choices. Hence, this study proceeded on more of specific literature on the built environment and travel behaviour towards improved children independent mobility. It draws lessons from an overview of military geography, culture and its built environment that will enable the integration of experiences for a policy framework that fits into barrack.

2. LITERATURE REVIEW

2.1 Overview of Military Geographies, Culture and its Built Environment

Military geography can be expressed from the perspective of how its activities and institutions are constituted geographically (Woodward, 2005). It covers a broad scope including analysis of land use beyond battlefields and the environmental impacts of activities, explorations of representations and interpretation of military landscapes. It also involves investigations into the economic and social relations of military capabilities and the lifestyle of military personnel. The military environmental discourses draw its inspiration from related works of literature. It involves the cultural geography that argues general terms of space and places viewed not as a given entity existing outside of social practice (Herman and Yarwow, 2014). Most analysts are concerned with the way the natural environment is constituted through several social and cultural practices (Snider, 1996; Williamson Murray, 1999; Coates et al., 2011). Thus, military installations represent a vital element of biodiversity conservation (Boice, 2006). Due to their large size and the usual tendency for military authority to strictly regulate human behaviours on their land (Vanderpoorten et al., 2005; Boice, 2006). Military activities prevent land-use changes such as subdivision which is often allowed on other properties. Interestingly, military installations usually present snapshots of what the landscape resemblance when the facilities were created (Boyne, 2008; Jenni et al., 2012 and Woodward, 2013).

The American, for instance, formed a substantial military complex located in fewer, smaller urban centres. Such military housing estates are usually referred to as villas militares, in many

Brazilian cities. The estate contained a small number of housing units. The Army alone owns around 20,000 housing units (Valença, 2010). They were found necessary due to the country's extensive territory as well as the nature of the military service. The Armed Forces maintained a corporate rental sector of houses and apartments in addition to the barracks housing. It explains the military-built environment and housing diversities and great lessons to learn. Notably, Military personnel often move from one place to another, living their families behind. The built environment and gated communities created by the military shapes the children. Their independent mobility in the barrack is a veritable area to monitor their development via a policy that promotes healthy living during and after deployment. Hence, the Army installations and their housing must emerge from a modernisation program. (Valença and Bonates, 2010). However, rapid urban growth that brought the surrounding city close to the military bases is also a source of concern. It incorporates them into new neighbourhoods that have an influence on children. Thus, the military installations, including bases, and quarters play a role in urban development. It created a more desirable environment and urban landscape compared with the more densely built-up surrounding areas. However, military areas are gated-communities that have spread over time, especially in peripheral regions, during the last two decades. It consolidated new neighbourhoods, and the landscape of houses or small blocks of apartments that are notable, always well kept, clean, and with elegant architecture (Pearson, 2012).

Similar to this experience, the Nigerian military barrack housing is predominantly quarters for its personnel, civilian staff and their dependents. However, integration of children's experience and opinions in the built environment towards independent mobility policy formulation are non-existent in the military barrack. Meanwhile, experience showed that the historical and comparative exploration, primarily of western military culture covers the change in military culture and the relation between military culture and the larger society. The study of military culture is not exhaustive and not limited to the conduct of the war. But the study of those beliefs, norms, values, rituals, and other symbolic productions that organise and sustain military organisations. The uniqueness of the military reflects in preparation and conduct of ceremonies, esprit de corps, military discipline, etiquette, staff work, the experience of war, and military technology. The regimental culture in the military further enhances control, which is binding on residents including children. The bullying culture imbibed in training has become part of the military lifestyle over time. It has impacted on the behaviour of children and environmental friendliness of barracks. The perception of children's independent mobility by parents and their travel choice behaviour experiences is equally affected by the military regimental culture. It constitutes parental and environmental restriction to children living in the barrack. Therefore, it is essential to study the built environment and behaviour towards their opportunity to harness the benefits of independent mobility as they grow. It entails the promotion of child-friendly military barracks community in Nigeria. Therefore, understanding of the military geography, culture and its built environment will help in achieving child-friendly barrack towards improved independent mobility of children.

The military barracks-built environment characteristics need to connect its neighbourhood size, street, the physical design of spaces, and residential population density. It also includes land use mix, availability of access to recreational facilities, and parks. The effect of adult mobility

is entirely explained by the generally acceptable environmental characteristics as posited by Atherton, (2009). Additionally, the mental and physical issues faced by ex-forces personnel and their families including homelessness suicide, physical incapacity, domestic violence, crime and incarceration, substance abuse and mental illness (Herman and Yarwood, 2014). Notably, the support for military families has centred on the few areas researched by social scientist and health caregivers during and after deployment (Gewirtz et al., 2011). Their education, medical care (Eaton et al., 2008) academic achievement was also focused (Engel et al., 2010). The physiological and perceived physiological stress reactivity in children and adolescents were studied, but not connected with built environment studies for a holistic policy on the use of outdoor environment as a therapy (Evans et al., 2013). Their family's strengths and challenges during peace and war is not yet integrated into a policy that can employ the child-friendly built environment to shape the children living in the barrack (Park, 2011). How well have children been integrated into the residential area of the barrack to make them feel like other children in society is essential? Hence, this study focused on their independent mobility in barrack residential environment.

Generally, military barracks in Nigeria range from small outposts to military cities containing up to 100,000 people. The population of children in barracks is usually more than adults, especially the ages of 5-12 years in primary schools (Author and Ismail, 2019). The study of the built environment, socio-economic characteristics and outdoor utilisation of barrack private space draw lessons from the review of past studies on children's play areas. The built environment of a typical military barracks community is mostly determined by the house type, quality of structure, sources of water supply, electricity, and needs satisfied (Author and Ismail, 2019). It also includes parking spaces, modes of environmental sanitation, type and use of the toilet, kitchen and its use. Studies have explicitly shown that children's independent mobility is strongly associated with active outdoor play and active travel. Children with more freedom to move without adult's accompaniment develop social skills and stronger bonds with friends and community. Such children are also in a better position to navigate and interact in neighbourhoods, including military barracks. Children's opportunity for independent mobility builds their confidence and self-esteem (Hillman et al., 1990; Joshi et al., 1999). Regrettably, children now have mobility restriction than before (Fyhri et al., 2011), including the barrack (Author and Ismail, 2019). Research of Australian children revealed that 32% of 8–12-year-olds deprived a range of average 100 m without adult supervision, while 64% no longer work up to 1 km from their home environment (Veitch et al., 2008). This limitation contributed to the low physical activity levels concerning health issues.

2.2 Active Travel Behaviour

Active Travel behaviour in military barracks is affected by a wide range of factors including socioeconomic status such as promotion, posting, educational background, number of wives, children, other dependants, and income stratification (Author and Ismail, 2019). Also important is the accessibility to neighbourhood facilities. It includes the nature of roads in the neighbourhood, distance to the workplace, and transport modes. The importance of improved road safety for children in barracks communities is significant to architects, planners and

policymakers as barrack housing are places where personnel and dependants live, including children. Pedestrians and cyclists must be provided with a safe environment where they are not intimidated by traffic-related issues and be accorded priority in living quarters. However, owing to inadequate studies linking other researches to the built environment and active travel modes in military barracks community, a conceptual model for policies to improve independent mobility of children is essential in developing countries, especially the military barrack. Lessons from research conducted in developed countries and related domains like cities, campus and housing estates were appraised to promote independent mobility policy formulation in the military barracks of Nigeria. It is also essential to consider the 3- dimensional space that gives comfort, which is often influenced by parental decisions, children's concerns and fears of traffic. These factors restrict them from biking, mostly the boys who are more in a position to own bikes (Hillman et al., 1990). Researches have shown that the effect of gender in children's independent mobility due to parental fears and concern to have them at home for domestic works, especially for space planning. It led to creating a physical and psychological barrier that hinders opportunity of places where adults and children interact and further give room for parents to control their children. To an extent, parents often segregate children claiming to safeguard them to structured places for them to play for a determined period.

The views of parent and children on travel choice behaviour were elaborated in a study of the component of children's active travel on independent mobility. It refers to their ability to move around freely without supervision (Hillman et al., 1990). It was found to have further benefits for children as it improves interaction with friends (Prezza et al., 2001). The development of spatial and navigational skills (Rissotto and Tonucci, 2002), as well as a sense of community identity (Prezza and Pacilli, 2007). Despite the benefits of active travel and independent mobility among children, many parents still drive their children to and from school and other destinations in cities, including the barrack. Karsten (2005) posited that many children in the category of been driven to most destinations, including structured activities that are organised by adults were discovered. These children were deprived of spatial experience in their neighbourhoods than those children who are allowed to walk or cycle around without adult supervision (Rissotto and Tonucci, 2002). It was established that road safety and perceived danger from strangers are common reasons cited for parents driving their children instead of allowing them to walk or cycle.

Notwithstanding, it was clear that the pedestrian friendliness of the urban environment is better described using composite indices. Hence, many have been proposed for walkability type (Frank et al., 2007). Most of them served as tools for evaluating and designing walkable communities and cities to improve the chances of walking in modal choice. Therefore, transport policies now included walking mode as a significant player. It is believed to be associated with characteristics of the built environment which in turn affects destination accessibility. However, dense cities pose many other problems such as traffic congestion, inadequate open spaces, and environmental pollution. Because environmental satisfaction is an essential factor for determining one's mode of travel, overcrowding in cities may not promote walking. In another study that examined the built environment's impact on walking, Frank and Pivo (1994) showed that population and employment density correlates with preferred modes of travel. In the

submission of related studies, it was deduced that density, diversity, and road connectivity in the built environment promote walking. Hence, the result indicated that higher population density, land-use mixture, and road connectivity are strongly associated with a higher number and longer duration of walking trips ability (Eoma and Cho, 2015).

Ecological models are commonly used in active travel specific to physical activity behaviour research (Bronfenbrenner, 1979). The model theorised physical activity as at multiple levels. It includes intrapersonal factors like age, gender, cultural beliefs, interpersonal relationships and characteristics of the family consisting of social conditions, and the built environment. It also provides a framework to study the factors that affect the independent mobility of children. Past researches showed that boys have a more degree of freedom than girls which extends as children get older (Veitch et al., 2008). Parent's view of traffic safety and the danger of stranger in the neighbourhood (Foster et al., 2014; Santos et al., 2013) correlate with their permission for children to move around freely. It was a qualitative study of parents' view on children's active free-play (Veitch et al., 2005). The children's degree of freedom and behaviour were considered to be significant to the individual degree of association with active free-play. The study found that opportunities for children's physical activity include participation in structured activities at school, organised sports, and less formal activities. It includes walking and cycling to school and active free-play. It was posited that time spent outdoors is one of the most consistent determinants of children's physical activity (Sallis et al., 2000). To a lesser extent, independent free-range and child reports of an escort during travel and play behaviours have topmost in use recently (Foster et al., 2014; Oliver et al., 2015). Therefore, appraising where children play in outdoor space becomes very relevant to improve independent mobility as well as considering a set of rules for parental licence a mediating social construct in the military barracks of Nigeria. This study, therefore aligned with Bronfenbrenner (1979) theoretical frameworks.

3. METHODS

This study selected relevant surveys for review to generate the gap from five main interdisciplinary fields. It included built environment, transportation, social sciences, health and place and military architecture. A total of 500 journal articles pertinent to the topic were selected and reviewed to see the trend (see Appendix A). Additionally, the interfaces between the built environment and travel mode behaviour in the related discipline were examined in the context of the barracks for the development of enhanced independent mobility of children. It involved the use of questionnaire administered jointly to elicit responses from 390 parent and children living in Sam Ethnan Air Force Barrack in Lagos, Nigeria. Exploratory factor analysis was performed using principal component analysis in SPSS. After that, measurement and structural models in PLS-SEM predicted enhanced conceptual framework of independent mobility of children towards policy formulation.

4. DISCUSSION

The results, findings and discussion covered the appraisal of the built environment and travel behaviour studies, exploratory factor analysis as well as the measurement and structural model's evaluation.

4.1 Built environment and travel mode choice behaviour

The result illustrates that the built environment has 10% of early research from 1935 to 1999, 10% between 1999 to 2010 and 15% from 2010 to 2019. It means that works in the built environment, especially in architecture and landscape architecture, were scanty. urban planning that took the lead, followed by housing, environmental engineering, land use, children environment and space & place relationship. In the field of transportation, 20% publication from selected authors from 1935-1999, 20% in 1999-2010, 30% from 2010-2019. It covers areas of transport modes, transport behaviour, transport and health, transport and geography, active transport and independent mobility and transport policy. It means that many researchers gave attention to the independent mobility of children with more from 2010 to date. But most of them were not properly connected with the built environment and travel behaviour for policy formulation, especially in developing countries. The multidiscipline in social sciences include publication in areas of social science & behaviour, ecological indicators, sociology, space & society, environmental psychology, planning education, human geography, children geographies, and remote sensing. 1935-1999 (40%), 1999-2010 (30%), 2010-2019 (25%). It means that more studies were carried out by seminal authors of which theories were posited from early 1935. The health and place have an early start on the campaign of independent mobility of children. From the selected articles, there is 25% publication from 1935-1999, 30% in 1999-2010 and 25% from 2010-2019. it covers health & place behaviour, public health, urban forestry, preventive medicine, quality of life, physical & mental health, and rural health studies. Attempts were made to link the built environment and transportation, but proper policy connection was little. Lastly, the military architecture records low studies from 1935 to 2019 with 5%, 10% and 5% respectively. It covers an area of military geographies, military culture & landscape and built form & deployment but no focus on independent mobility and policy connection (see Appendix A for the summary of result). Hence, the studies have revealed a significant policy connection gap between the built environment and the other four fields of study.

4.2 Exploratory factor analysis

The exploratory factor analysis result of the barrack environment and travel mode- choice behaviour is displayed in Table 1. Only items that meet the Cronbach Alpha of 0.7 thresholds were used for further analysis. The causal relationships verified the consistency of children's independent mobility indicators, environment characteristics and travel behaviour factors. It examined inter-item correlations and internal consistency following the methodology. The dependent variable consisted of four independent mobility of children's indicators that met the factor loading. They included the destination accessibility (IMCI1), population density (IMCI2), home geographical range (IMCI3), and average travel time (IMCI4). Two

independent variables were the barrack environment characteristics made of five items. They include barracks environmental quality (BEC1), quality of housing amenities (BEC2), children's participation (BEC3), basic services (BEC4) and safety and security (BEC5). Travel mode behaviour factors is the second independent variable that consisted the distance to school and play area (TMCB1), age and gender of children (TMCB2), NAF policy on education, housing and legislation (TMCB3), traffic safety fear (TMCB4), danger of strangers (TMCB5), and fear of injury to children (TMCB6).

The Kaiser-Meyer-Olkin (KMO) and Bartlett's test confirmed satisfaction in the strength of association between items in the questionnaire administered to children and their parents in the barrack. The outcome showed sample acceptability of 0.967 at 0.000 level of significance, which is well above the threshold of 0.7 Cronbach's Alpha coefficient. It means that responses and strength of relationship among indicators, characteristics and factors considered in this study were adequate for analysing their influences on independent mobility of children in barracks. The exploratory factor analysis brought measurable items together to form a structure in the predicted model. Items were grouped into components to investigate their relevance at the same time test for validity and contribution to the perceived model. The principal component in the exploratory factor analysis included extraction based on varimax rotation, the threshold for factor extraction of Eigenvalue >1 . The factor loadings above 0.7 were retained (Jolliffe, 2002).

4.3 Measurement and structural models' evaluation

The PLS-SEM combined the correlation and multiple regression of the interactions (Wang et al., 2011) between barrack environment characteristics and travel mode behaviour factors. Thus, Research Hypotheses 1 and 2 were formulated to see the causal relationship between the barrack environment characteristics and travel mode choice behaviour on independent mobility of children in which the null and alternative hypotheses were set. Table 2 displayed the result of a reflective measurement model. It combined the causal effects of barrack environment and travel behaviour on the independent mobility of children. The reflective measurement model showed outer loadings of all items >0.7 above the Cronbach's alpha threshold. Besides, the composite reliabilities indicated 0.99 for the IMCI, 0.99 for BEC, and 0.98 for TMCB constructs which were all >0.7 . The convergent validities of 0.87 for both constructs were >0.5 . Moreover, the convergent validities were 0.95 for IMCI, 0.95 for BEC, and 0.87 for TMCB constructs were >0.5 . Furthermore, the Heterotrait-Monotrait (HTMT) values were 0.07 and 0.19 which were <0.9 at 95% confident interval. Hence, the constructs have fulfilled the discriminant validity. Consequently, the statistical prediction outcome in Research Hypothesis 1 rejected the null hypothesis as the direct effect caused a positive value of 0.447 in the relationship between BEC and IMCI. Similarly, TMCB and IMCI produced 0.174. Hence both predicted at R^2 value of 0.353. The alternative hypothesis was accepted, which means that BEC and TMCB have a significant direct effect on IMC. A tolerance level ≥ 5.000 (Hair et al., 2011) or ≥ 3.000 (Diamantopoulos and Signaw, 2006) indicates potential collinearity. Hence, both predictor constructs were considered acceptable in this study. The estimates obtained indicate the hypothesised association among constructs. The standardised value is between -1 and +1

for the path coefficient in a structural model. Close to +1 showed strong positive association which is statistically significant. The association is weaker when the path coefficient is close to 0. It means that low values close to 0 are non-significant. The result of this study revealed a strong association among BEC and TMCB to IMC.

The structural model's evaluation involved a direct effect that exists between BEC → IMCI and TMCB → IMCI. In this model, children and their parents perceived child-friendliness of barrack with the quality of its environment, housing amenities, children's participation, basic services as well as safety and security characteristics as vital in the planning policy. Similarly, the distance to school and playground, age and gender of children, traffic safety fears, the danger of strangers, fear of injury to children, and NAF policies on transportation, education and legislation as well as the availability of car were essential to travel behaviour factors. These factors were relevant for active travel behaviour for improved policy framework of independent mobility of children in the barrack. Moreover, the structural model assessment included a path analysis of the barrack environment characteristics and travel behaviour factors (see Figure 1). They predicted the independent mobility of children at 0.353 and 0.174 totalling path coefficient of 0.621. It means that the sum of all reflexive measurement items in the two constructs explained 62.1% variance in predicting improved conceptual framework of children's independent mobility. The bootstrapping indicated a path significance larger than the critical value of 1.96 between the predictors and predicted model. BEC → IMCI was 6.05 at 0.000 significance level, TMCB → IMCI was 2.31 at 0.021 level of significance. Thus, the t-statistics of 6.05 and 2.31 at the p-value of 0.000 and 0.021 significance level were acceptable in this study. Consequently, the barrack environment characteristics and travel behaviour factors caused direct effects on parental license at an R^2 value of 0.353. In the results illustrated, the effect size of barrack environment on independent mobility of children was 0.115 (medium). Likewise, the effect size of travel behaviour on the independent mobility of children was smaller at 0.017. Thus, the Research Hypothesis 1 and were positively significant on the independent mobility of children in the barrack. In summary, the barrack environment has the most substantial effect on the independent mobility of children. The two constructs showed the variance of independent mobility. The sizes of the path coefficient were statistically significant. Based on the sizes, the hypothesised path relationship between barrack environment and parental license and travel behaviour were substantial. From observation, the path coefficient with standardised values above 0.10 is significant. Based on the estimated path coefficient and their significance, the conceptual model developed from Horelli and Bronfenbrenner theoretical frameworks and hypothesised were substantiated empirically in this research. Moreover, the examination and investigation of relative sizes of the significant path relationship, the barrack environment and travel behaviour have relative importance in predicting the policy framework of independent mobility of children in the barrack. This study was in consistence with Li and Zhao (2015). However, it considered a few factors compare to this study that explored the school and play area for determining travel mode behaviour. In this study, the barrack environment and travel behaviour have significant effects on the independent mobility of children.

This research finding showed that child-friendly barrack environment characteristics were the

quality of the environment, housing amenities, basic services, children participation as well as security and safety. The decline in children's independent mobility was attributable to influences of barrack environment and travel behaviour over time. These were evident in the result of measurable indicators and opinions that revealed hinderances to decline the independent mobility of children. It includes high population density, lack of pathways and bike lane accessible to school and play areas. There is no catchment policy on the home geographical range and travel time as well as land-use change that can improve the situation. Housing development without proper planning and travel policy have affected the barrack natural environment over time.

5. CONCLUSION AND AREAS FOR FUTURE RESEARCH

The study appraised past studies on the built environment and travel behaviour towards improved children independent mobility in the military barrack. A significant relationship was found to exist between the built environment and travel behaviour which influences independent movement. The findings revealed a gap in policy connection of researches from social sciences, transportation, health and place with the built environment to create a child-friendly barrack and active travel behaviour. A conceptual framework of enhanced independent movement of children was developed towards a policy formulation and contribute to the existing body of knowledge in environment-behaviour studies. Likewise, the neglect in researches on children living in the barrack owing to the wrong perception of its built environment need to be corrected. The child friendliness of barrack and active behaviour is required to develop socially, mentally and cognitively. It will, in turn, promote their quality of life and well-being. The findings from this study are applicable to para-military barrack, housing estates, campuses and compact cities in developing countries including Nigeria.

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Table 1: Exploratory factor analysis for the three constructs

Rotated Component Matrix ^a			
	Component		
	1	2	3
Item			
IMCI3	.925		
IMCI2	.922		
IMCI4	.916		
IMCI1	.865		
BEC3		.835	
BEC1		.830	
BEC4		.827	
BEC5		.826	
BEC2		.763	
TMCB4			.879
TMCB2			.877
TMCB6			.864
TMCB5			.825
TMCB3			.820
TMCB1			.754

Table 2: Reflective measurement model predicting the independent mobility of children in the barrack

First Order Latent Construct	Reflective Measurement Indicators	Outer Loading	CR	AVE	Discriminant Validity
		0-1 > 0.7	0.7-0.9	> 0.5	HTMT confidence level doesn't include 1
IMCI	IMCI1 (B1)	0.96	0.98	0.95	YES
	IMCI2 (B2)	0.97			
	IMCI3 (B3)	0.98			
	IMCI4 (B4)	0.98			
BEC	BEC1 (C1)	0.98	0.99	0.95	
	BEC2 (C2)	0.92			
	BEC3 (C3)	0.99			
	BEC4 (C4)	0.98			
	BEC5 (C5)	0.98			
TMCB	TMCB1 (D1)	0.92	0.97	0.87	YES
	TMCB2 (D2)	0.95			
	TMCB3 (D3)	0.90			
	TMCB4 (D4)	0.96			
	TMCB5 (D5)	0.90			
	TMCB6 (D6)	0.96			

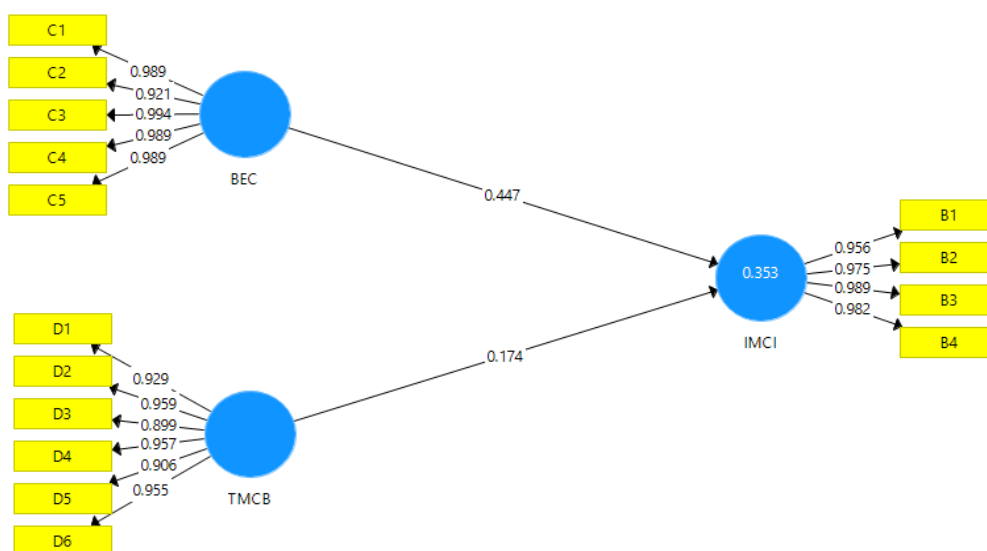


Fig 1: Path Analysis for Barrack Environment Characteristics and Travel Mode Choice Behaviour Predicting Independent Mobility of Children