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Factors Associated With Adults' Physical Activity In Bojongsoang District Bandung Regency

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ABSTRACT
Noncommunicable diseases (NCDs) have caused high burden of mortality in Indonesia. One of the main risk factors of NCDs is physical inactivity, which has become a problem in Bandung Regency. Biological, psychological, sociodemographic, sociocultural, and built environment (BE) factors affect physical activity (PA) levels. This study seeks to understand the factors that are associated with adults' PA in Bojongsoang District. This quantitative, observational, analytical study uses a cross-sectional design. The study population are adults aged 18-59 years old which are domiciled in Bojongsoang District, while the study sample is determined to be 250 people based on calculation of two proportion differences. Data is collected through questionnaire-based guided interview. Univariate analysis shows that the number of respondents that engage in PA at least 150 minutes/week is 69,2%. Multiple logistic regression results show that work (OR 0,555; CI 95% 0,313-0,983), private vehicle ownership (OR 4,351; CI 95% 1,188-15,940), and social support (OR 3,160; CI 95% 1,776-5,621) are associated with PA after controlling for other independent variables. Private vehicle ownership is the most dominant variable associated with adults' PA in Bojongsoang District. Community-oriented interventions to improve PA in Bojongsoang District needs to target the workers and those who use private vehicles.

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INTRODUCTION

Noncommunicable diseases (NCDs) have become one of the world's main health burden. In Indonesia, it is estimated that 76% of all deaths are caused by NCDs (World Health Organization, 2018). Physical inactivity, as one of the main risk factors for NCDs, is one of the many consequential problems concerning health behavior in a global scale. In 2022, approximately 1,4 billion adults (27,5% of world's adults population) do not meet the weekly duration of physical activity (PA) as recommended by the World Health Organization (WHO). The economic and health burden that are brought about by this problem is enormous (World Health Organization, 2022). Meanwhile, in Indonesia, according to the 2023 Indonesian

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Health Survey, the proportion of the population aged 10 or above that exercise less than 150 minutes per week is 37,4% nationwide (Badan Kebijakan Pembangunan Kesehatan, 2024). This number affirms the rising trend in recent years, specifically when compared with the data from the 2013 and 2018 Basic Health Survey, which is 26,1% and 33,8% respectively (Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan, 2018). In Bandung Regency, the proportion is 33,39% (Badan Penelitian dan Pengembangan Kesehatan, 2019); which still exceeds the national target of 28,5% (Kangsaputra, 2021). One plausible impact from this phenomenon, particularly in Bojongsoang District, is the high prevalence of NCDs, where hypertension and diabetes are recorded to be the second and sixth most prevalent diseases in the working area of Puskesmas Bojongsoang in 2022 (Puskesmas Bojongsoang, 2022).

The approach that needs to be taken by public health workers in designing the intervention plan to overcome NCDs, especially in an attempt to incorporate PA into daily lives, must be based on considerations regarding the many health determinants in all levels of society. Two aspects that have been viewed as potential opportunities to achieve that goal are active transportation and active recreation, which is encouraged to be an integral part of daily life (World Health Organization, 2018). Common terminologies for those two aspects are utilitarian PA (transport-related PA) and recreational PA (leisure-time PA) (Gabriel et al., 2012)

Studies have shown some correlates of PA; from intrapersonal, sociocultural, to built environment (BE) factors (Bauman et al., 2012; Sallis et al., 2006; Yen & Li, 2019). Intrapersonal factors can be categorized into biological, psychological, and sociodemographic factors (Yen & Li, 2019). Male sex is frequently identified as a correlate of PA, including in Indonesia (Abadini & Wuryaningsih, 2018). One of the psychological constructs that is often studied regarding its correlation with PA is self-efficacy (SE), which describes the level of one's confidence in regard to their capacity to plan and carry out specific behaviors (Bauman et al., 2012; De Silva Weliange et al., 2021; Sallis et al., 2006). Also, various sociodemographic factors have been studied, such as work status, education level, family income, residence sector (urban or rural), and vehicle ownership (Bauman et al., 2012; De Silva Weliange et al., 2021; Steinmetz-Wood et al., 2020; Yen & Li, 2019).

Numerous concepts have been put forward to portray how behaviors are being influenced by sociocultural factors. One of the more frequently studied concepts in PA literature is social support (SS), which is the perception of four types of support from family and friends to carry out health behaviors, specifically PA; which include emotional, instrumental, informational, and companionship support (Smith et al., 2023).

In the last two decades, the BE as an influencing factor of PA has been frequently studied. Especially in the last few years, there is a considerable amount of systematic reviews which underline the strong association between the BE and the degree and pattern of PA (Kärmeniemi et al., 2018; Zhang et al., 2022). A study in eleven countries found generalized evidences that show the association between mixed land use and pedestrian facilities (such as sidewalks) with PA (Ding et al., 2013). Lastly, a massive study which investigates the association between BE characteristics with walking and cycling behaviors in 21 countries

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shows that accessibility and diversity of mixed land use, street connectivity, crime and traffic safety, and also aesthetics are associated with at least one of the two activities mentioned (Boakye et al., 2023). However, the relationship between these two has not received much attention in public health research in Indonesia (Muzayanah et al., 2022). Based on all these things, this study seeks to identify the factors associated with adults' PA in Bojongsoang District, Bandung Regency.

METHODS

This is a quantitative, analytical, observational study with a cross-sectional design. The independent variables are sex, SE, education, work, income, vehicle ownership, SS, and BE characteristics. The study population are adults aged 18-59 years of age which are domiciled in Bojongsoang District, while the study sample is determined to be 250 people based on calculation of two proportion differences, and are chosen by simple random sampling. Inclusion criterion for samples is that they must have been residing in Bojongsoang District for at least six months. Exclusion criteria are (1) having a physical or mental disability and (2) women in pregnancy.

Study sample is chosen proportionately according to the number of rukun warga (RW) from each of the six villages in Bojongsoang District. A random number generator is used to determine the RWs that are to contain the study samples. Next, rukun tetangga (RT) are chosen randomly from each chosen RW. Lastly, the author visits the head of each chosen RT, and based on the list of families obtained from the head of RT, study subjects are selected randomly.

All of study data are primary data collected through questionnaire-based guided interview, which were carried out in person by the author and an enumerator at the respondents' place of residence after obtaining an informed consent. The questionnaire consists of four sections. The first section contains brief questions regarding biological (sex), sociodemographic (education, work, income, vehicle ownership), and sociocultural (SS) variables. Measurement of SS is adapted from the Social Support for Physical Activity (SSPA) scale (Smith et al., 2023). There are four kinds of SS which are being covered by five questions in this scale: emotional, instrumental, informational, and companionship. The second part of the questionnaire measures SE, which is based on the Exercise Self-Efficacy Scale (ESES) (Ahlström et al., 2015; Urell et al., 2021). The third part refers to the Physical Activity Neighborhood Environment Scale (PANES), which is an internationally validated questionnaire to measure the BE characteristics quantitatively, based on the subjective perceptions of the respondents (Ding et al., 2013; Sallis, 2002). There are eleven constructs that encompass the BE characteristics which are covered by this questionnaire, which are (1) residential density, (2) land use mix, (3) transit access, (4) street connectivity, (5) pedestrian infrastructure, (6) bicycling infrastructure, (7) recreation facilities, (8) crime safety, (9) traffic safety, (10) pedestrian safety, and (11) aesthetics. The last part measures PA by its weekly duration, which is the sum of the duration of two PA domains covered in this study, which are recreational (leisure-time) and utilitarian (transport) PA (Steinmetz-Wood et al., 2020).

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All instruments adapted from the originally English questionnaires have undergone validity and reliability tests.

All data will be converted accordingly into categorical data. Categorization of SE, SS, and BE characteristics will be based on a cut-off value, which is determined to be the median value of the data obtained. Education is categorized into low (graduated from high school or lower) and high (graduated from higher education) groups. Income is categorized into two groups with the minimal wage of Bandung Regency as the cut-off value.

Data analysis consists of three parts. First, univariate analysis of the variables was carried out to acquire descriptions of respondents' characteristics and each of the independent variables. Next step is variables selection for multivariate modelling through bivariate analysis. Finally, multivariate analysis is carried out using the prediction model of multiple logistic regression to identify effect size and statistical significance. This study has obtained ethical clearance from the Commission of Ethical Clearance, Faculty of Public Health, Universitas Indonesia.

RESULTS AND DISCUSSION

Female makes up 53,6% of respondents, while 13,2% of respondents are young adults aged 18-25. The two villages with the most respondents are Bojongsari and Bojongsoang, which respectively comprises 25,6% and 22,8% of all respondents. Sundanese (88,0%) and Muslims (97,6%) constitute the clear majority in ethnicity and religion. Twenty percent of respondents completed higher education; while sixty percent have a job, either full-time or part-time. Those who do not work mostly consist of the retired, the housewives, or young adults who are still undergoing education. The percentage of respondents that have monthly family income of equal or greater than the minimum wage of Bandung Regency is 46,4%.

The percentage of respondents that have total duration of weekly PA (which consists of utilitarian and recreational PA) of 150 minutes or more are 69,2%. When observed individually, 37,6% of respondents carry out at least 150 minutes per week of utilitarian PA, while in the recreational domain the number is only 26,4%.

Bivariate analysis shows that all of the independent variables bar education have p values of <0,25. The seven remaining variables are further analysed in multivariate modelling. Multivariate analysis shows that three variables have significant associations with PA – work, vehicle ownership, and SS – after controlling for other variables. Those three variables' combined contribution to adults' PA in Bojongsoang District is 13,1%. Vehicle ownership is the most dominant variable that is associated with PA.

Table 1. Characteristics of Respondents

Characteristics	n	%
Sex		
Female	134	53,6
Male	116	46,4
Age		
Young adults (18-25)	33	13,2
Adults (26-59)	217	86,8

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Characteristics	n	%
Village		
Bojongsari	64	25,6
Bojongsoang	57	22,8
Buahbatu	34	13,6
Cipagalo	25	10,0
Lengkong	39	15,6
Tegalluar	31	12,4
Ethnicity		
Sundanese	220	88,0
Javanese	17	6,8
Mixed	6	2,4
Batak	3	1,2
Padang	3	1,2
Minahasan	1	0,4
Religion		
Islam	244	97,6
Christianity	6	2,4

Table 2. Description of Physical Activity (PA)

Variable	n	%	Min.-Max.	Mean	SD
Total PA			4-850	246,21	160,225
Low	77	30,8			
High	173	69,2			
Utilitarian PA			0-650	136,63	103,985
<150 mins/week	156	62,4			
≥150 mins/week	94	37,6			
Recreational PA			0-765	109,58	114,836
<150 mins/week	184	73,6			
≥150 mins/week	66	26,4			

Table 3. Distribution of Respondents Based on Independent Variables' Association with Physical Activity

Variable	Physical Activity		Total	p value
	Low	High		
	n (%)	n (%)	n (%)	
Biological factor				
Sex				0,195*
Female	46 (34,3)	88 (65,7)	134 (100)	
Male	31 (26,7)	85 (73,3)	116 (100)	
Psychological factor				

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Variable	Physical Activity Low n (%)	Physical Activity High n (%)	Total n (%)	p value
Self-efficacy				0,011*
Low	45 (38,8)	71 (61,2)	116 (100)	
High	32 (23,9)	102 (76,1)	134 (100)	
Sociodemographic factors				
Education				0,837
Low	61 (30,5)	139 (69,5)	200 (100)	
High	16 (32,0)	34 (68)	50 (100)	
Work				0,045*
No	38 (38,0)	62 (62,0)	100 (100)	
Yes	39 (26,0)	111 (74,0)	150 (100)	
Income				0,195*
Low	46 (34,3)	88 (65,7)	134 (100)	
High	31 (26,7)	85 (73,3)	116 (100)	
Vehicle ownership				0,100*
Yes	74 (32,3)	155 (67,7)	229 (100)	
No	3 (14,3)	18 (85,7)	21 (100)	
Sociocultural factor				
Social support				0,001*
Low	51 (42,5)	69 (57,5)	120 (100)	
High	26 (20,0)	104 (80,0)	130 (100)	
Built environment (BE) factor				
BE characteristics				0,061*
Low	41 (36,9)	70 (63,1)	111 (100)	
High	36 (25,9)	103 (74,1)	139 (100)	

*) Candidate variable (p <0,25)

Table 4. Multivariate Modelling Steps

Independent variables	p value					
	Step 1	Step 2	Step 3	Step 4	Step 5	OR (95% CI)
Sex	0,917	0,917	-	-	-	-
Self-efficacy	0,087	0,083	0,077	0,081	-	-
Work	0,142	0,140	0,084	0,059	0,044*	0,555 (0,313-0,983)
Income	0,999	-	-	-	-	-
Vehicle ownership	0,028	0,028	0,028	0,024	0,026*	4,351 (1,188-15,940)
Social support	0,001	0,001	0,001	0,001	0,001*	3,160 (1,776-5,621)

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Independent variables	p value					
	Step 1	Step 2	Step 3	Step 4	Step 5	OR (95% CI)
BE characteristics	0,265	0,262	0,239	-	-	-
R Square	0,153	0,153	0,153	0,146		0,131

*) Variable with significant association (p <0,05)

This study tries to elaborate the pattern of adults' PA in more detail. In spite of the 69,2% of respondents that have high PA; only 37,6% and 26,4% of respondents meet the required duration through one domain, in this case, transportation and leisure-time respectively. A study in Montreal and Toronto, Canada, shows a contrasting propensity, where the number is higher on the leisure-time domain. They found that 21,67-22,26% of respondents carry out utilitarian PA for at least 150 minutes/week, while in the domain of leisure-time, the number is 31,16-32,19% (Steinmetz-Wood et al., 2020). The contrast between the two may underline the different preferences of Indonesians and Canadians in spending their free time, with Indonesians tend to have significantly more screen time (Meltwater & We Are Social, 2024), which implies sedentariness. This finding is noteworthy, especially when other studies show the importance of utilitarian PA in helping people achieve sufficient PA. A study found that while 73,8% of adult Singaporeans meet the recommended PA duration, only 24,3% of them routinely carry out recreational PA (Win et al., 2015). Another study in Ethiopia and Mozambique also found that leisure-time PA contribution to total PA is rather low (Mengesha et al., 2019; Padrão et al., 2012). This similarity across countries with different socioeconomic levels emphasizes the need for encouraging people to engage in active recreation.

Sex shows no significant relationship with PA in this study. This is quite uncommon, as multiple studies have shown otherwise, such as in office workers in Jakarta (Abadini & Wuryaningsih, 2018); Singaporean population (Win et al., 2015); as well as adults in Taiwan (Yen & Li, 2019), Malaysia (Cai Lian et al., 2016), Sri Lanka (De Silva Weliange et al., 2021), Ethiopia (Mengesha et al., 2019), and dozens of countries in Europe (Gerovasili et al., 2015). All of them show how men tend to carry out more PA than women. To explain this, it has to be noted that work-related PA was not covered in this study, which might influence the result, since men tend to have more physically demanding work. Also, in the context of Bojongsoang District, there are two phenomena which may play a role: (1) the routinely scheduled PA events that are dominated by women, such as aerobic exercise, and (2) the tendency of women to perform PA for transport, since a lot of households only own one vehicle, and most of the time it's the men who use the vehicle.

SE is also found to be not associated with PA. This is also in contrast with the more common findings in previous studies, such as in Sri Lanka (De Silva Weliange et al., 2021) and Lhokseumawe, Aceh (Rahmi et al., 2021); where it is shown that SE are positively associated PA. In another, more intricate systematic review, though, it is found that this relationship is rather inconclusive, particularly in regard to the adoption of PA as a habit (Rhodes & Quinlan, 2015). This is notable because PA interventions are expected to have a

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long-lasting impact. Another study found that SE is very much affected by extrapersonal factors, such as SS. People tend to feel more efficacious in completing tasks, which includes performing PA, when they observe how other individuals are also engaging successfully in them. This notion, which was first put forward by Albert Bandura, is known as "vicarious experience" (Kim et al., 2021). Indonesian society is well-known to have a collectivistic culture (The Culture Factor Group, 2023), so it is plausible that SS is more relevant than SE in encouraging people to carry out PA.

This study also found no relationship between education and PA. This is in line with the study in Canadian adults (Steinmetz-Wood et al., 2020), but not with other studies in Asia and Europe (Cheah, 2011; Gerovasili et al., 2015; Win et al., 2015; Yen & Li, 2019). A study on Malaysian adults found a significant but negative relationship. There may have been a cultural devaluation of PA that renders it unattractive, difficult, or even dangerous (Cai Lian et al., 2016).

Work is found to be negatively associated with PA in this study. In other words, non-working respondents tend to have more PA than their working counterparts. Similar result is also found in a population study in Singapore (Win et al., 2015), but a positive relationship is found in a study on Ethiopian adults (Mengesha et al., 2019). People that do not work understandably have more free time to engage in other activities, but it has to be noted that this study has a rather loose definition of work, unlike the study in Singapore, where they further differentiate the working group by their employment status. Knowing where people work, or whether they are working part-time and full-time, for example, may need to be considered in future studies, since it is shown that duration and flexibility of working hours may affect PA in workers (Chakrabarti & Shin, 2017). Furthermore, recall that this study does not include occupational PA.

No significant relationship is found between income and PA. High social status groups may have more access, awareness, and opportunities to engage in PA (Cheah, 2011; Patil & Sharma, 2021); but low-income groups are more likely to use active transportation modes because of its affordability. The result of this study is consistent with the study on adults from Taiwan (Yen & Li, 2019), but not so with studies from Sri Lanka (De Silva Weliange et al., 2021), Penang (Cheah, 2011), and California (Chakrabarti & Shin, 2017).

Next, vehicle ownership is shown to have a significant negative relationship with PA. Similar results from Canada (Steinmetz-Wood et al., 2020) and the USA (Chakrabarti & Shin, 2017) also reinforce this finding. The public transportation system in Bojongsoang District is not evenly and extensively accessible throughout the region. In one of the questions regarding the BE in this study, 53,2% of respondents say that mass public transportation modes are not easily reachable by foot. Therefore, utilitarian PA becomes an exhausting and uncomfortable way to travel, and it is especially unattractive for those who own a vehicle.

SS is the third and final variable in this study that is found to be significantly associated with PA, and the only one with a positive relationship. Studies in Sri Lanka (De Silva Weliange et al., 2021) and Jakarta (Abadini & Wuryaningsih, 2018) also show comparable results. As mentioned already before, Indonesia's collectivistic society may play a major role (Minkov & Kaasa, 2022), and this also applies in Sundanese society (Setyaningrum et al., 2022).

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Collectivistic worldview regards self as more as a part of the larger community rather than as an individual being, and there is a strong preference to conform to the prevailing communal norms (The Culture Factor Group, 2023). Family ties and friendships within the neighborhood are observed to be strong in daily living in Bojongsoang District, which is assumed to be the grounding for the habit of exercising and playing sports in the community level; such as badminton, cycling, football, jogging, and table tennis.

Lastly, BE characteristics are measured as a global score in this study, and no association with PA is found in this study. This is not in line with a study in Missouri that also measures the BE characteristics globally (Adlakha et al., 2015). Other studies, which are prevalent in recent years, tried to study individual constructs of BE in their relationships with PA (Barnett et al., 2017; Boakye et al., 2023; Ding et al., 2013; Elshahat et al., 2020; Rocke et al., 2023). Two of the constructs most commonly associated with PA are mixed land use and pedestrian facilities (Ding et al., 2013). Interestingly, the respondents' perception regarding these two constructs within Bojongsoang District is very much in contrast. Mixed land use is the most positively viewed construct, with 78,8% of respondents see them favorably. On the other side, the quality of pedestrian facilities are perceived as generally poor, where only 12,6% of respondents view them positively, which makes it the second lowest construct of the BE to be favorably perceived, after cycling facilities. Another study in Indonesia also shows that there are no significant relationship between PA and BE characteristics. Development endeavors in Indonesia tend to put more emphasis on road and highway construction, as well as buildings, with little regard to public open spaces that may enhance social interaction as well as PA. Moreover, this study found that the BE constructs commonly associated positively with PA instead show negative associations, which implies that the quality of urban planning in Indonesia does not have enough potency to encourage the public to engage in PA (Muzayanah et al., 2022).

CONCLUSION

Two sociodemographic factors, which are work (OR 0,555; CI 95% 0,313-0,983) and vehicle ownership (OR 4,351; CI 95% 1,188-15,940), and a sociocultural factor, which is SS (OR 3,160; CI 95% 1,776-5,621); are found to be significantly associated with adults' PA in Bojongsoang District after controlling for sex, self-efficacy, education, income, and built environment characteristics. The variable with the most dominant association with adults' PA in Bojongsoang District is vehicle ownership. The results from this study may be used as considerations by the authorities to design and plan evidence-based, community-oriented, and well-targeted interventions to increase PA, especially on workers and vehicle-users. Future studies to identify the factors that are associated with PA in other regions could provide a larger picture of the pattern of PA in the national scale.

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