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Comparing the pace of life of a city: Size and average temperature as predictors

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Abstract
Pace of life has been found to be associated with various life outcomes such as mental health and well-being to information distribution and economic development. Every city has a different pace of life due to its specific characteristics. Across two studies, we examined the role of temperature and number of populations (city size) as the predictors of pace of life. In the first study, we compared Bandung and Jakarta and in the second study, we compared Jakarta and Depok. Each pace of life index was generated by mean scores of walking speed, working speed and clock accuracy. Through field observation in each city's Central Business District, we found that based on temperature, Jakarta has higher means of walking speed (M=15.3) compared to Bandung (M=13.6), significantly with mean difference 1.71 (t(158)=5.32, p<.001, d=.841). Jakarta is also significantly higher on the working speed indicator (M=25.7) compared to Bandung (M=17.5) with mean difference 8.22 (t(18)=2.49, p=.011). In the second study, we found that Jakarta has significantly lower means of walking speed (M=14.3) compared to Depok (M=17.9) with mean difference 3.54, t(158)=11.058, p<.001. Similarly, Jakarta also has lower means of working speed (M=18.58) and clock accuracy (M=1.33) compared to Depok (M working speed=19.9, M clock accuracy=3.67), although not significant. Overall, as predicted, based on temperature, the colder city Bandung has a faster pace of life compared to Jakarta. Jakarta also has a faster pace of life compared to Bandung, although significant only for its walking speed.
Keywords: *pace of life; temperature; population; central business district*

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Introduction

Urban life has been subject to many studies. This could be attributed to its fast development compared to rural areas. One dimension of urban life is regarding its pace of life. Previous researches have compared cities' pace of life both within and between countries (Amato, 1983; Garhammer, 2002; Gross, Murthy, & Varshney, 2017; Levine & Bartlett, 1984; Levine & Norenzayan, 1999).

Pace of life is has been found associated with various life outcomes (Paiva, Cachinho, & Barata-salgueiro, 2017). Pace of life is correlated to suicide rate (Lester, 1999), quality of life (Garhammer, 2002), and heart diseases (Levine & Bartlett, 1984). It is also been found associated with stress levels (Lippke, Schalk, Kühnen & Shang, 2021), effort exhausted to work (Vedula & Kim, 2017), high level of body temperature which induces stress (Melnikov, Krzhizhanovskaya, Lees, Sloot, 2020), driving speed (Goldbach, Hoffmann, Hoppe, Pitz & Thommes, 2020) and work performance (Hoffmann, Hoppe & Ziemann, 2021; Hoffmann, Hoppe & Ziemann, 2022). Not only affecting people directly, pace of life could also influence the rate of information distribution in one area. For example, pace of life could cause information distribution through social media platform like Twitter faster (Gross et al., 2017). In conclusion, pace of life is one important predictor of mental and physical health as well as information accessibility.

One research conducted by Levine and Norenzayan (1999) in cities among 31 countries. They had found various factors predicting pace of life in a city, namely economy, temperature, cultural values and number of populations.

This research will focus on two aspects which are temperature and number of populations. Cities with colder temperatures are predicted to have a faster pace of life. Other than temperature still rarely researched on, temperature is chosen because Levine and Norenzayan research was conducted in different cities from different countries in which this aspect interacted with cultural values that could affect pace of life differences. Our first study aims to revisit this research question whether temperature could predict pace of life by comparing two cities within the same country with different temperatures in one country with similar cultural values.

Jakarta and Bandung have different climates. Jakarta's average temperature is 27.6 °C while Bandung is 23.3 °C. Data was taken from climate-data.org, which is a website compiled of world cities' temperature. Average temperature difference 4.3 °C between cities is considered sufficient to explain differences in cognitive capabilities (Yeganeh, Reichard, McCoy, & Bulbul, 2018). Yeganeh et al. (2018) found that a difference of 4.34 °C could decrease cognitive performance by as much as 0.4%. Cognitive performance is an indicator of pace of life in terms of working speed. Research on temperature difference also found not only influencing working speed, this difference also influences walking speed (Lan, Wargocki, & Lian, 2014). Physical performance tends to decrease in hotter climates (Ozgunen et al., 2010). Temperature also influences economic activity (Heal & Park, 2013), which in turns predict pace of life (Levine & Norenzayan, 1999; Walmsley & Lewis, 1989). Based on these researches, we hypothesized that Bandung will have a faster pace of life compared to Jakarta.

Second factor chosen is the number of populations since previous researches have indicated the bigger the city, the faster the pace of life (Levine & Bartlet, 1984; Amato, 1983; Bornstein, 1979; Finnis & Walton, 2008; Franek, 2013). One of big city indicators is the number of populations. This pace of life difference could be attributed to its economic activity (Walmsley & Lewis, 1989). The bigger the city, the higher the living cost which turns its citizens to put time in high regard and increase their tendency to feel running out of time in search of money (Walmsley & Lewis, 1989).

This research is a replication study of Levine and Norenzayan's Pace of life of City in 31 Countries. We conducted two studies using two cities within the same country. The first study was conducted to test the influence of temperatures towards pace of life. Cities chosen as the target cities are Jakarta and Bandung, Indonesia. Various reasons were considered to pick these two cities.

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First reason was the ease of accessibility. Both are big cities with relatively close distance separating them. Second reason was that these two cities have quite significant climate differences.

Second study was conducted to test the effect of the number of populations towards pace of life. This second study was conducted to compare pace of life between two cities in Indonesia, Jakarta as megapolitan city with estimation of 10.37 million people (katadata.co.id, 2018) and Depok as metropolitan city (Utami & Kurniawati, 2018) with estimation of 2.26 million people (Badan Pusat Statistik Kota Depok, 2018). We also hypothesized that Jakarta will have a faster pace of life compared to Depok.

Method

Study 1

This study used field experiment design which manipulates variable independents through natural observation (Cozby & Bates, 2015). Data collection was conducted in two Central Business District (CBD) in Jakarta and Bandung. Jakarta's CBD consists of Senayan Central Business District (SCBD) and Kuningan, while Bandung's CBD consists of the area along Asia-Afrika street and R.E. Martadinata.

Observation on three pace of life indices described by Levine and Norenzayan (1999), those are:

Walking speed: Walking speed measurement was conducted in two different Central Business District areas in each city. Every person's walking speed was measured for each 20 meters marked by the observer. Every measurement was conducted using a digital stopwatch. The researcher excluded people with physical disabilities, children or window shoppers since their walking speed might be varied based on specific characteristics. The measurement were conducted during business operation time which is 9 AM – 5 PM.

Working speed: Working speed was measured by observing post office officers' working speed in 10 post offices spread along the two cities. Working speed was measured right after the letter was taken by the post office officer until they finished giving the change and the bill. Due to few numbers of post office, we decided to modify it into minimarts.

Clock accuracy: They also measured clock accuracy located in every public space in the two cities.

Some changes in the indices were employed to adjust the field situation, for example:

Walking speed: Walking speed measurement was conducted in two different areas in each city, SCBD and Kuningan in Jakarta, and Asia-Afrika street and R.E. Martadinata street in Bandung. Every person's walking speed was measured for each 20 meters marked by the observer. Every measurement was conducted using a digital stopwatch. We excluded people with physical disabilities, children or window shoppers since their walking speed might be varied based on specific characteristics. We conducted the measurement during business operation time which is 9 AM – 5 PM. Total number of samples observed was 80 people with 40 people in each observation point (n Male = 20, n Female = 20).

Working speed: Working speed was measured by observing minimart cashiers' working speed in 10 minimarts spread along the two cities. We bought a lollipop (controlled with similar brand across the minimarts) and paid exactly Rp10.000,- in cash so that we would always be given the money changes whether in paper or coin money. Working speed was measured right after the lollipop was taken by the cashier until they finished giving the change and the bill.

Clock accuracy: We also measured clock accuracy located in every public space in the two cities. We measured the accuracy by comparing the time on the clock with the time in our internet

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synchronized gadget. Public spaces targeted for this measurement are the closest hospitals with our location in both cities.

Data analysis was conducted by comparing means of each indicator used for the pace of life measurement. We also conducted the overall pace of life index for each city, by transforming the scores to standardized Z-scores. Each indicator and the overall pace of life index differences for both cities will be analyzed using independent sample t-test.

Study 2

We conducted an identical field experiment as in study 1 for study 2. The only difference is the target location. We collected data from two business areas of Jakarta and Depok. Jakarta's business area chosen was central business district in Sudirman while Depok's business area chosen was central business district in Margonda. Similar indicators were used and measured using similar situations. For working speed, we measured the working speed of minimart workers along the area in giving the money change after we bought 600 ml mineral water with Rp10.000,- cash (similar brand across each observation point). We also measured walking speed and clock accuracy with similar methods as study 1.

Result and Discussion

Result

Study 1

Below is the descriptive table for each measurement conducted using statistical program jamovi ver 0.9.2.8. Higher scores for both indicators and the overall index indicate the slower its pace of life.

Table 1. Measurement means of pace of life in Jakarta and Bandung

Descriptive	City	N	Mean	Mean diff.	Median	SD	SE
Walking speed	Jakarta	80	15.3	1.71	14.8	1.91	0.214
	Bandung	80	13.6		13.5	2.16	0.241
Working speed	Jakarta	10	25.7	8.22	24.2	9.57	3.02
	Bandung	10	17.5		16.4	4.16	1.32
Clock accuracy	Jakarta	3	4.00	0.333	4	1.00	0.577
	Bandung	3	4.33		5	4.04	2.33
Overall Pace of life Index	Jakarta	93	3.23	2.15	-0.218	0.989	0.103
	Bandung	93	1.08		-0.0574	0.989	0.103

Jakarta has higher means of overall pace of life index (M=3.23) compared to Bandung (M=1.08). Jakarta has higher means of walking speed (M=15.3) compared to Bandung (M=13.6), significantly with mean difference 1.71 ($t(158)=5.32$, $p<.001$, d=.841). Jakarta is also significantly

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higher on the working speed indicator (M=25.7) compared to Bandung (M=17.5) with mean difference 8.22 (t(18)=2.49, p=.011). Although not significant, mean differences were also found in clock accuracy indicator in which Jakarta (M=4.00) has slightly lower time differences compared to Bandung (M=4.33). The overall pace of life index showed Bandung has a faster pace of life compared to Jakarta. This result shows that temperature differences could influence walking speed and working speed in both cities. Colder temperature of Bandung support physical activities such as walking. Colder temperature also predicted cognitive performance (Yeganeh et al., 2018), which might explain why Bandung has faster working speed compared to Jakarta.

Study 2

Below is the descriptive table for each measurement for Jakarta and Depok's pace of life conducted using statistical program jamovi ver .9.2.8. Higher scores for both indicators and the overall index indicate the slower its pace of life.

Table 2 . Measurement means of pace of life in Depok and Jakarta

Descriptive	City	N	Mean	Mean Diff.	Median	SD	SE
Walking speed	Depok	80	17.87	3.57	17.63	2.259	0.253
	Jakarta	80	14.3		14.3	1.76	0.197
Working speed	Depok	10	19.99	1.407	20.5	6.51	2.06
	Jakarta	10	18.583		16.4	8.14	2.57
Clock accuracy	Depok	3	3.67	2.34	4	2.52	1.45
	Jakarta	3	1.33		1	0.577	0.333
Overall Pace of life Index	Depok	93	4.301	5.376	-0.108	0.989	0.103
	Jakarta	93	-1.075		-0.0398	0.989	0.103

Jakarta has lower means of overall pace of life index (M=4.301) compared to Depok (M=-1.075). Jakarta has significantly lower means of walking speed (M=14.3) compared to Depok (M=17.9) with mean difference 3.54, t(158)=11.058, p<.001. Similarly, Jakarta also has lower means of working speed (M=18.58) and clock accuracy (M=1.33) compared to Depok (M working speed=19.9, M clock accuracy=3.67), although not significant. Overall, as predicted, bigger city Jakarta has a slightly faster pace of life compared to Depok, although this difference is only significant in their walking speed.

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Discussion

Our first study shows that temperature could be a significant predictor for a city's pace of life. Bandung with colder temperature has the faster pace of life compared to Jakarta. This is in line with Levine and Norenzayan's classic finding which suggests hotter climate will predict slower pace of life. Previous research has shown how temperature could play a role into affecting physical and cognitive performance of an individual (Lan et al., 2014; Ozgunen et al., 2010; Yeganeh et al., 2018) which in turn will predict the cities' pace of lives. Bandung's colder temperature facilitates more productive working space and increases its speed.

However, there still exists contradictory findings in explaining the relationship between pace of life and temperature, since other researchers have suggested bigger city will predict faster pace of life compared to smaller one (Levine, 1990; Amato, 1983; Levine & Bartlett, 1984). Jakarta is by a number larger than Bandung so based on this finding, it's supposed to have a faster pace of life. On the contrary, what we found did not support this hypothesis. Future research could address this gap to explore which indicator play the bigger role in explaining a city's pace of life. We also acknowledge the sample limitation of our study which might contribute to the difficulties in finding generalization.

Our second study was aimed to replicate the findings by previous research regarding the impact of a bigger city (Levine, 1990; Amato, 1983; Levine & Bartlet, 1984; Bornstein, 1979). Although not significant, our general findings in the second study are in line with this prediction. This pace of life difference could be attributed due to the difference in living expenses between two cities (Walmsley & Lewis, 1989). Jakarta has a higher living expense compared to Depok. Monthly expense for Jakarta reaches 7.5 million Rupiah per month, and is the most expensive city to live in Indonesia (Depokrayanews.com, 2017). This fact could turn Jakarta people to feel more rushed by the time and they tend to move faster to fulfill their daily needs.

The failure to acquire significance in our second study can also be explained by the limited number of samples, especially in the working speed and clock accuracy indicators. We failed to gain the minimum sample for t-test of 10 (Bordens & Abbott, 2011) in the second study due to the fact that there were minimum numbers of minimarts located in the second area of the observation. We suggest future research to consider adding more samples or find other working situations that can be measured.

Our study is the first to replicate Levine and Norenzayan (1999)'s study in Indonesia and also expand it by comparing two cities located in the same country. Previous research has found differences among cities from different countries (Amato, 1983; Bornstein, 1979; Levine & Bartlet, 1984; Levine & Norenzayan, 1999). This decision of choosing different countries comes from the fact that the pace of life could also be explained by cultural differences, which are more salient between countries. However, our findings generally indicate that pace of life could also differ by different cities in one country with more similar cultures and this difference is better explained by the temperature and the number of populations.

Pace of life has been found to be associated with various life outcomes such as stress levels (Lippke, Schalk, Kühnen & Shang, 2021; Melnikov, Krzhizhanovskaya, Lees, Sloot, 2020), working performance (Vedula & Kim, 2017), and even health (Levine & Bartlett, 1984) to suicidal tendencies (Lester, 1999). This implication can be considered to highlight the importance of the pace of life measurement index of a population in a country. By developing this idea, we hope future research could expand the pace of life study and its impact especially in Indonesia which comprises more diverse cities, cultures and economic capital.

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Conclusion

Our study supports the idea of temperature as the predictor of a city's pace of life. By comparing Bandung and Jakarta as two cities with contrasting temperature levels, we found that the colder city Bandung has a faster pace of life compared to Jakarta. Although not overall significant, we also found that Jakarta as a bigger city compared to Depok has a slightly faster pace of life, especially in terms of walking speed. This finding lays a basic foundation for future research to regard pace of life as an important indicator for population comparison, and eventually as a predictor of better life outcomes among cities in Indonesia.

Suggestion

We failed to replicate some of the findings due to sample limitation which is also restricted by the small range of observation points in our study. We suggest future research to conduct a larger scale pace of life index measurements by expanding observation area, adding more cities with comparable characteristics and more indicators to get a more comprehensive look of cities' pace of lives.

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