



広島大学大学院 国際協力研究科 交通工学研究室

Hiroshima University Transportation Engineering Laboratory



途上国都市の公共交通整備前段階におけるモビリティマネジメント - インドネシア・バンドンを対象とした実証分析 -

広島大学大学院 国際協力研究科 交通工学研究室

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© 石川太陽、藤原章正

背景 -過度な私的交通利用の影響-



交通事故

環境問題



交通渋滞

健康問題



公共交通の整備



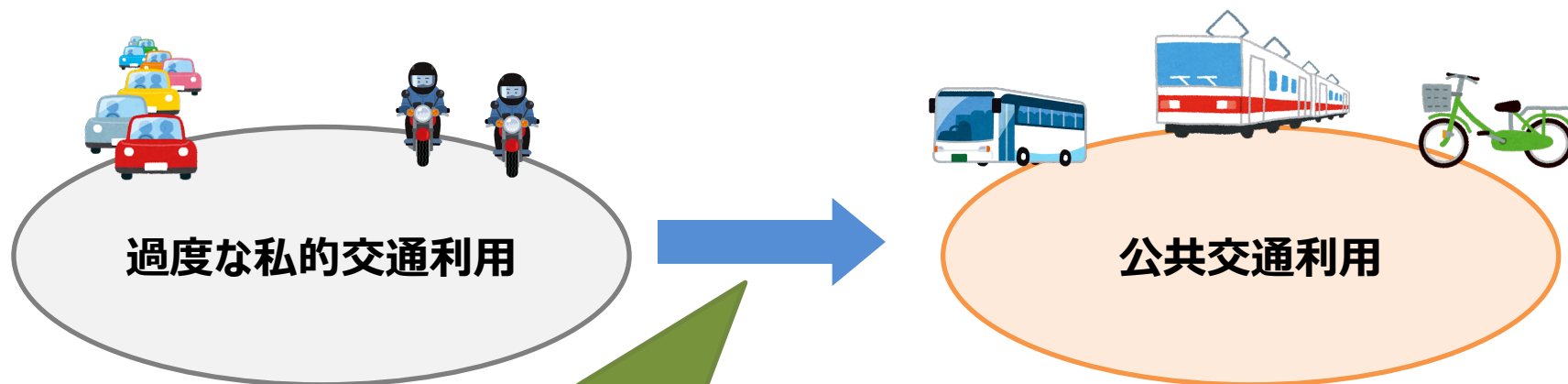
住民の利用意向が低い場合、公共交通の整備が実施できない可能性



将来の公共交通に対する利用意識の向上が必要

モビリティマネジメント(MM)

- ✓ コミュニケーションを通して自発的に人々の行動変容を促す政策
→ 過度な私的交通利用から公共交通利用への転換を促す



CO₂ emission and transportation use

Air pollution is one of the world's largest killers; responsible for 6.4 million deaths per year (1 in 9 deaths). This is three times higher than the number of deaths from AIDS, Malaria and tuberculosis combined.

The figure compares the amount of CO₂ emission in each transportation.

The Private vehicles tend to emit much CO₂. Relying on automobile or motorcycle might cause environmental issues.

Mode	CO ₂ Emission (g/km)
Plane	147
Bus	56
Train	22

(Source: Ministry of Land, Infrastructure and Transport)

無料通勤送迎バス案内 11月3日～28日

田中様 への

田中様への無料通勤送迎バス案内

バス停: 田中様へのバス停

バス時刻表

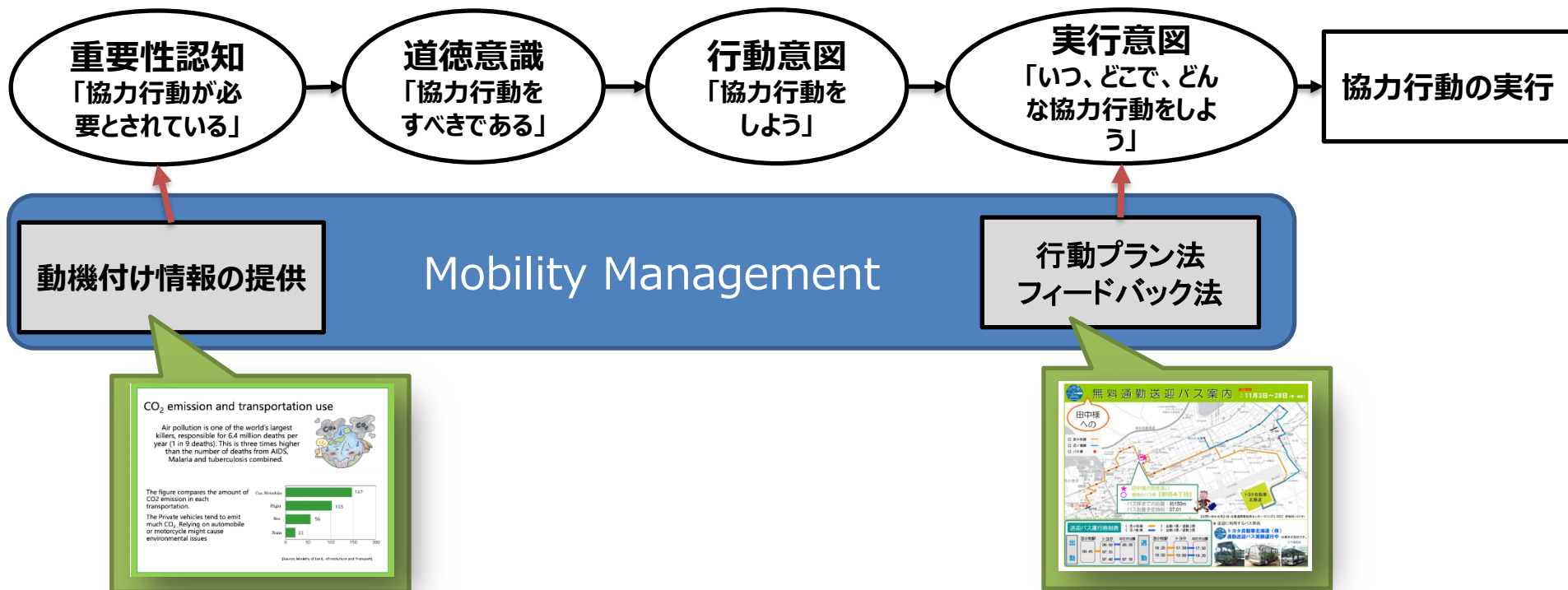
バス	乗車	降車
1	08:00	08:30
2	08:30	09:00
3	09:00	09:30
4	09:30	10:00
5	10:00	10:30
6	10:30	11:00
7	11:00	11:30
8	11:30	12:00
9	12:00	12:30
10	12:30	13:00
11	13:00	13:30
12	13:30	14:00
13	14:00	14:30
14	14:30	15:00
15	15:00	15:30
16	15:30	16:00
17	16:00	16:30
18	16:30	17:00
19	17:00	17:30
20	17:30	18:00

コミュニケーション

行動変容プロセス

協力行動への行動変容プロセス

(藤井聡、社会的ジレンマの処方箋、2003)



公共交通整備前段階における行動変容プロセスの仮説



→ 公共交通整備前段階においても、動機付け情報の提供により将来の公共交通に対する利用意識の向上が見込まれるのではないかと？

研究目的

**途上国都市での公共交通の整備を促す政策としてのMMの効果
を計測し、途上国都市でのMMの意義を考える一助とする**

インドネシア バンドン市を対象として、

- ① 公共交通整備前段階の都市においても、動機付け情報を提供することで、重要性認知・道徳意識・行動意図に影響を与えるか分析
- ② 動機付け情報の種類や個人属性による、重要性認知・道徳意識・行動意図への影響の違いの分析

分析対象

インドネシア バンドン市

都市内の主な交通機関：

車、バイク、アンコット（パラトランジット）

Gojek、Grab、ect.,

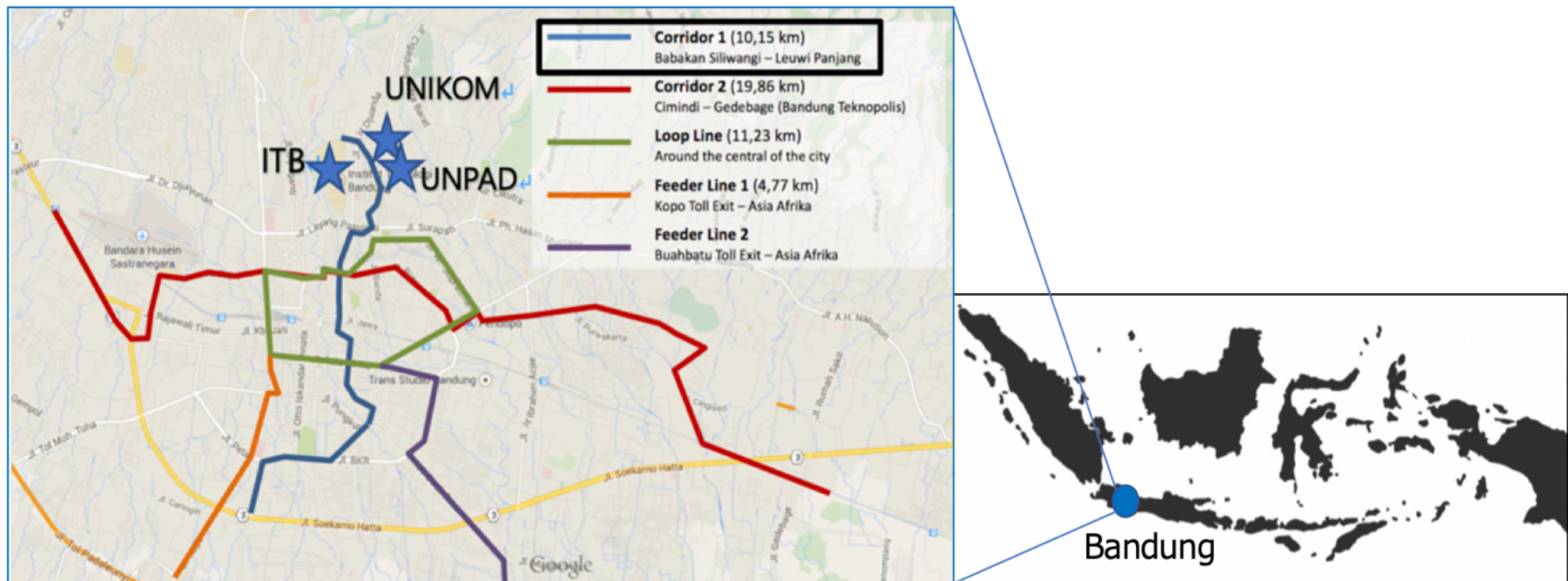
→ 市は今後**LRT整備を検討中**



分析対象

整備予定のLRT駅周辺3大学の学生

計585サンプルを取得（平均年齢21.4歳、標準偏差3.5歳、男性52%）



分析手法

回答者を以下の3群に分け、重要性認知・道徳意識・行動意図の活性度合いを比較

A: 間接的情報提供群

- ✓ 道路スペースへの影響
- ✓ 環境への影響

Road space and transportation use

The situation of traffic congestion is getting worse in Bandung. Traffic congestion makes it difficult to arrive the location in time, and it makes you annoyed.



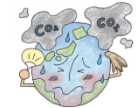
The figure compares how much road space is required when assuming that the same number of people are transported by each transportation. If transportation mode can be changed, traffic congestion might be alleviated in Bandung and the living would be better.



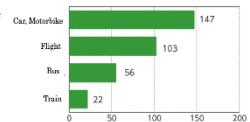
(Source: 臺北
運輸局運輸局
交通對策課)

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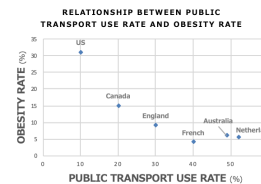
(Source: Ministry of Land, Infrastructure and Transport)

B: 直接的情報提供群

- ✓ 健康への影響
- ✓ 事故リスクへの影響

Obesity Rate and transportation use

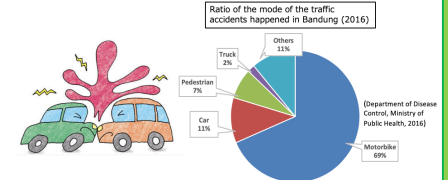
If you use LRT,
> You can burn off more calories and the risk of being obesity would be decreased



(Source: Genevieve Guisano and Susan Herson, The Geography of Urban Transportation)

Accident Risk and transportation use

If you use LRT,
> The accident risk will be decreased, and your family and friends will not need to feel sad because of the accident



(Department of Disease Control, Ministry of Public Health, 2016)

C: 制御群 (提供情報なし)

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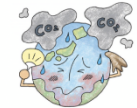
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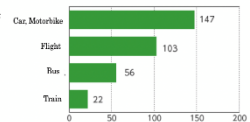
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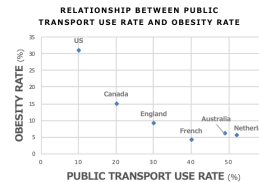
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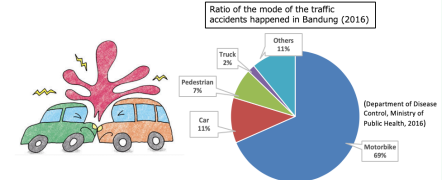


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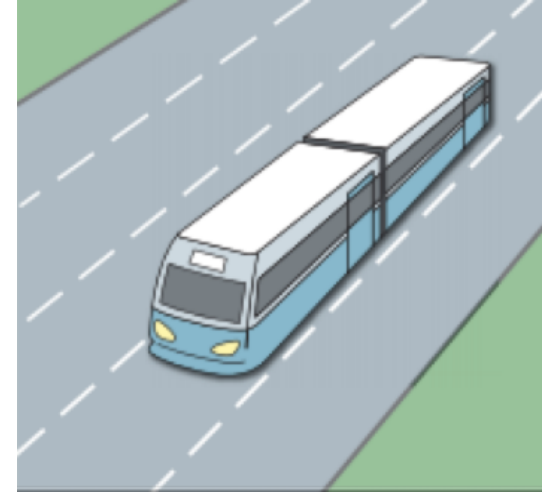
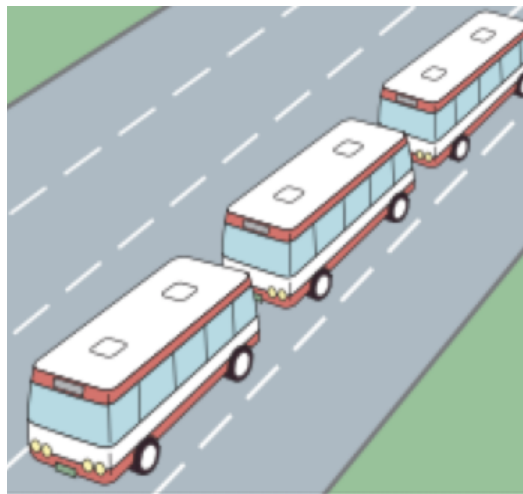
C: 制御群 (提供情報なし)

Road Space and transportation use

If you use LRT,

- The required road space would change, and the traffic congestion could be alleviated in Bandung

Comparison of the required road space when same number of people use each transportation mode

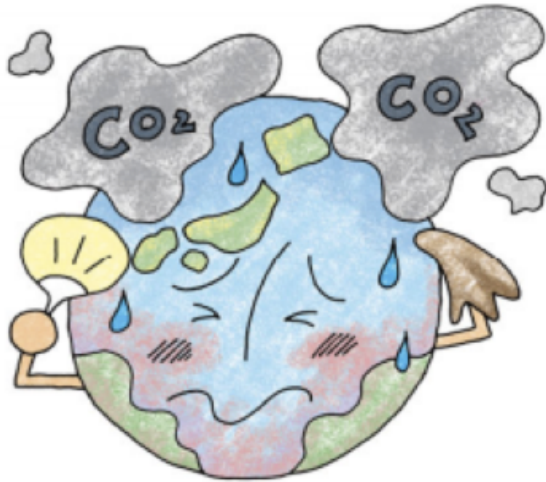


(Source; Aichi Prefecture Regional Promotion Division, Japan)

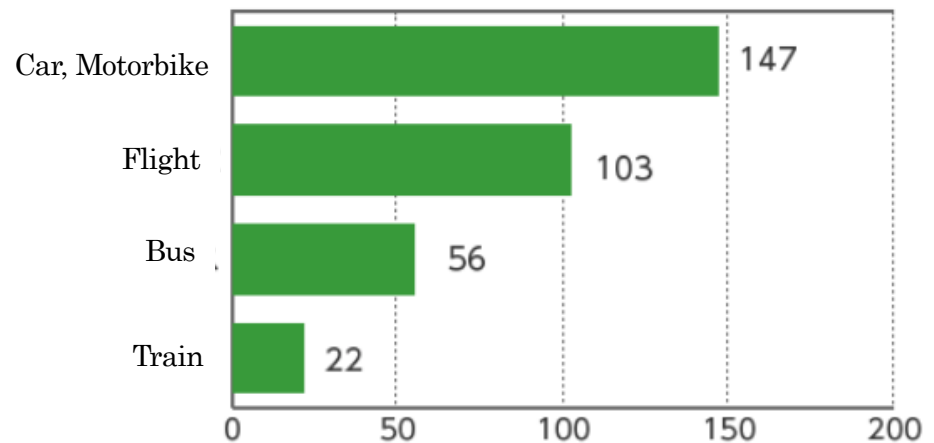
CO₂ Emission and transportation use

If you use LRT,

- The amount of CO₂ emission will be mitigated, and it will contribute to stop extinction of wildlife like polar bear



Amount of CO₂ emission per person per 1km movement
(g·CO₂ / People·km)



(Source; Ministry of Land, Infrastructure and Transport)

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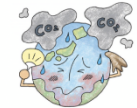
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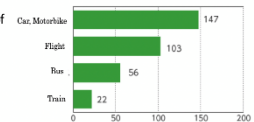
(Source: 臺北
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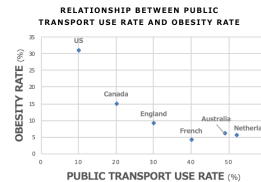
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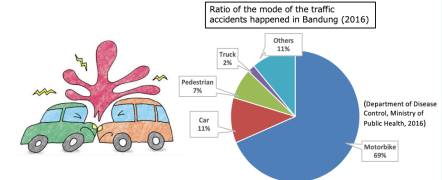
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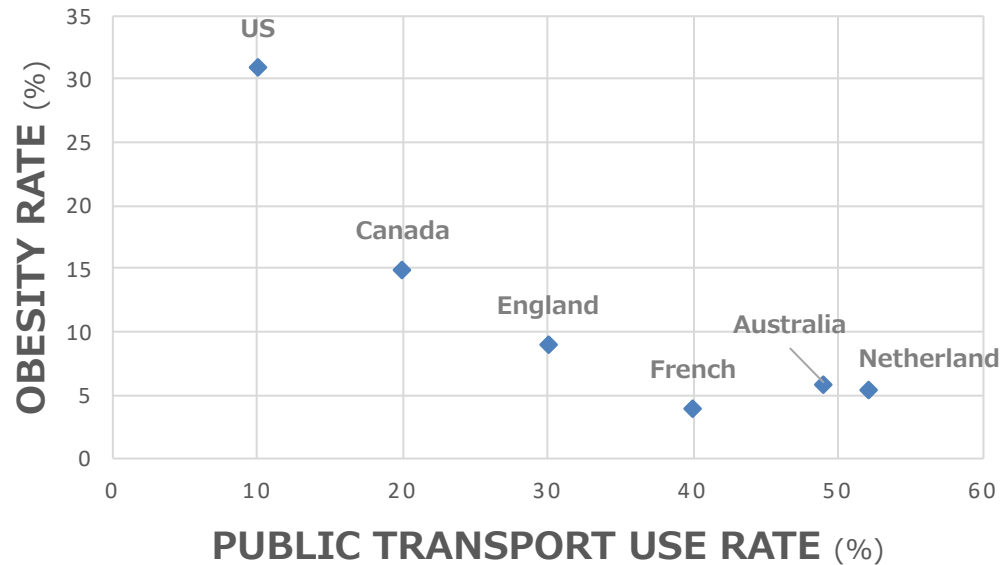
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RELATIONSHIP BETWEEN PUBLIC TRANSPORT USE RATE AND OBESITY RATE



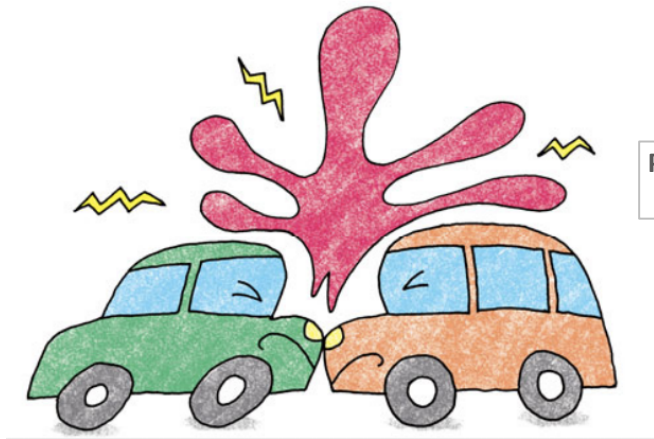
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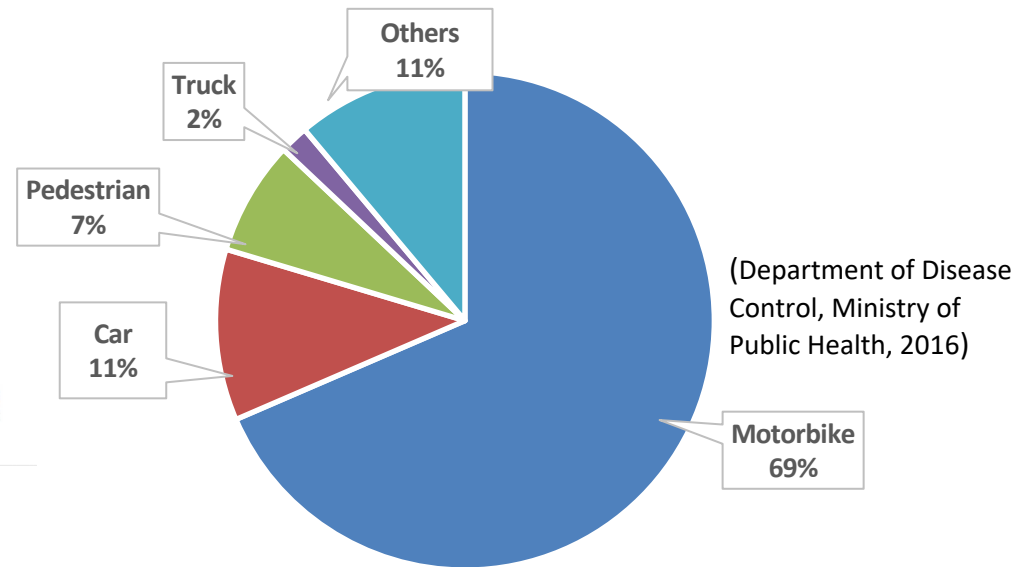
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Ratio of the mode of the traffic accidents happened in Bandung (2016)



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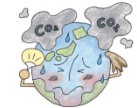
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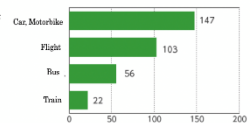
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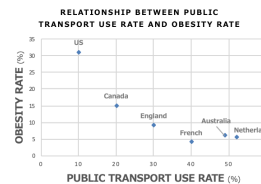
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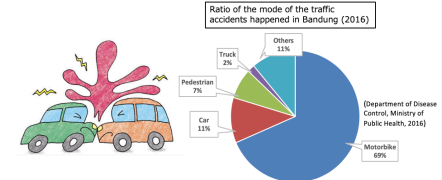
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分析手法

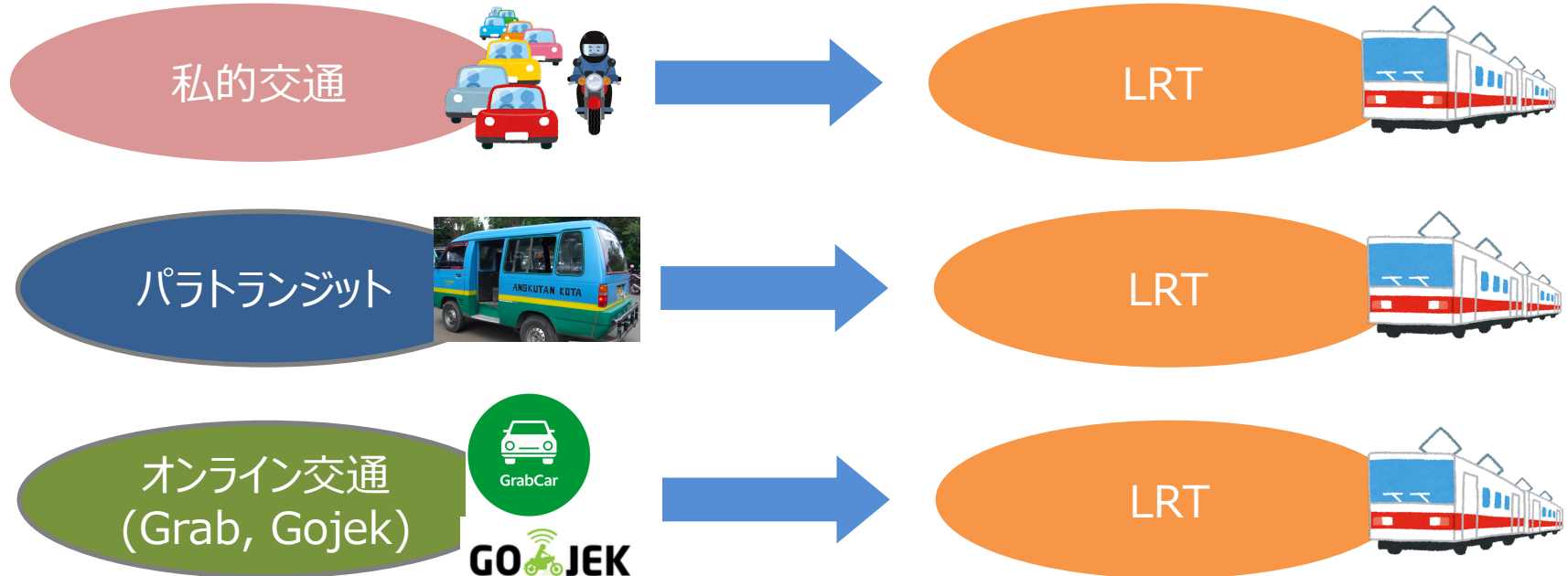
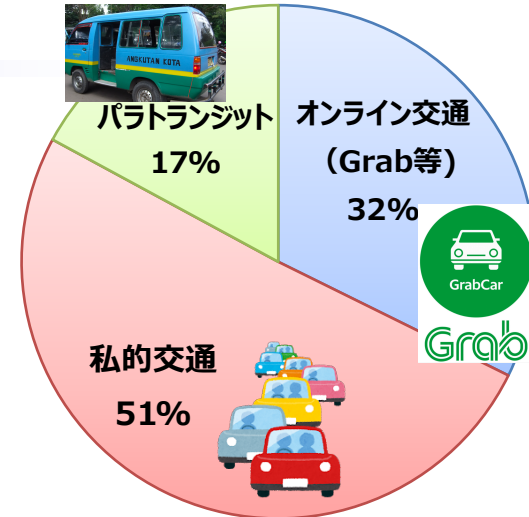
✓ 各項目の計測

	クロンバック α係数	質問項目 (7 grades evaluation; Strongly Disagree-Strongly Agree)
重要性認知	0.844*	It is inappropriate (not good) to rely on private vehicle
		Excessive private vehicle use is not desirable for society
道徳意識	0.814*	We should reduce excessive private vehicle use
		To what extent do you think it is necessary to reduce excessive private vehicle use?
行動意図	0.881*	If there's LRT, I intend to reduce excessive private vehicle use in the future
		If there's LRT, I intend to use it

*クロンバックのα係数：0.7以上であったため、分析では加算平均値を使用

主要利用交通手段

- ✓ モーダルシフトを促す対象は、政策の最終目標によって変わり得る
(私的交通のみを減らすか、パトランジットの数も減らすか等)

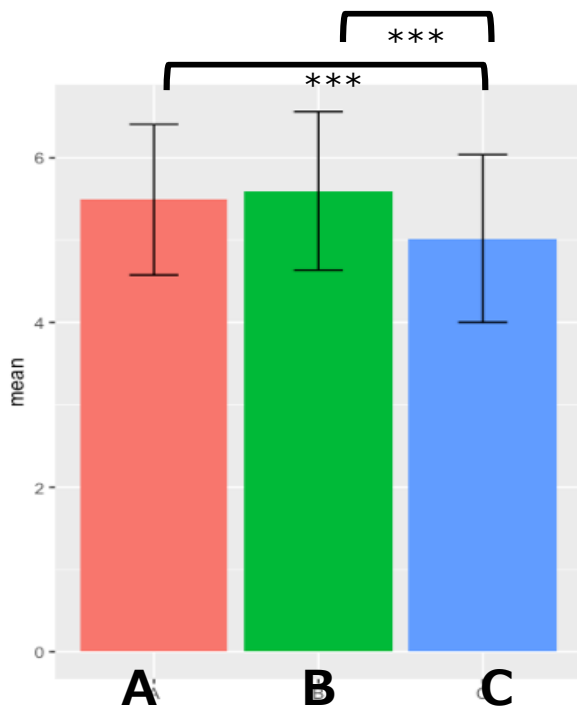


多重比較検定

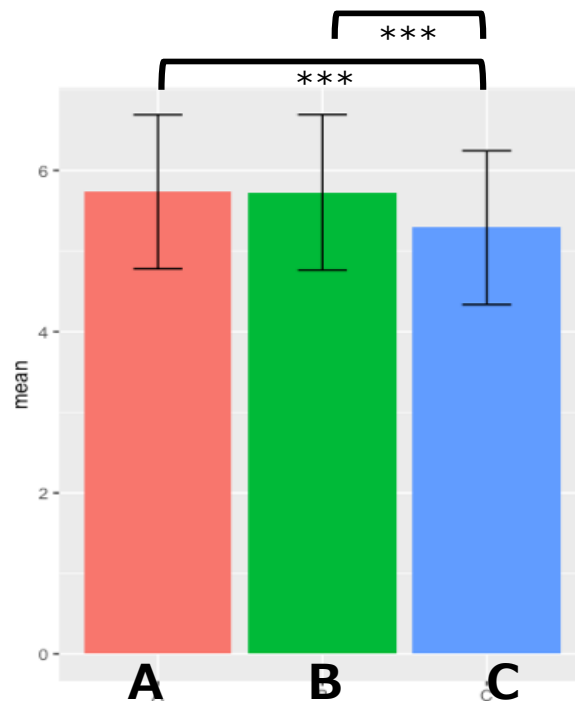
各心理指標の活性度合いについて、群間の違いを把握

多重比較検定 (全サンプル)

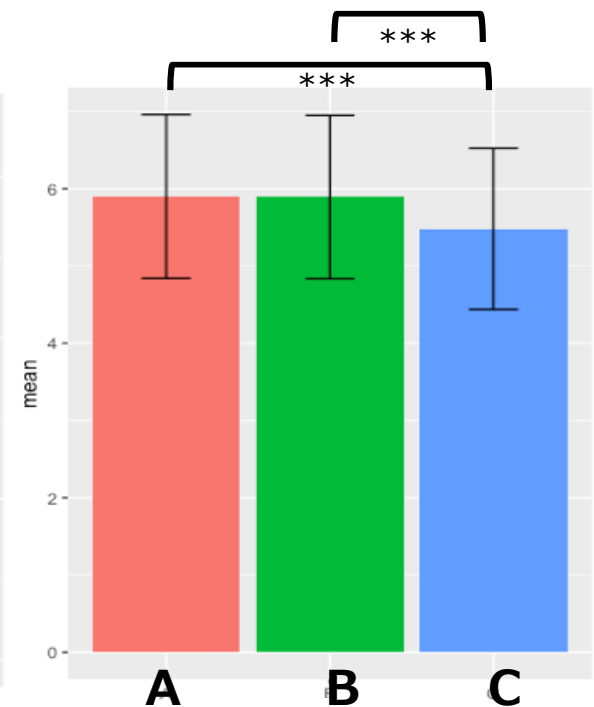
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重要性認知
「協力行動が必要とされている」



道徳意識
「協力行動をすべきである」

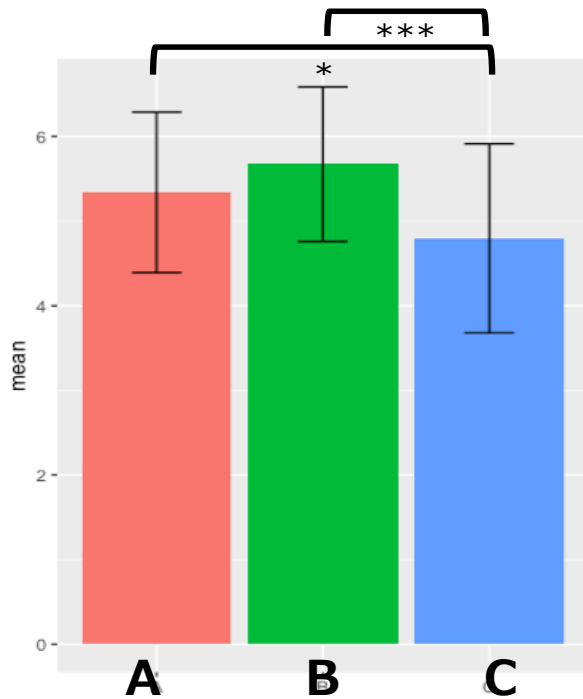


行動意図
「協力行動をしよう」

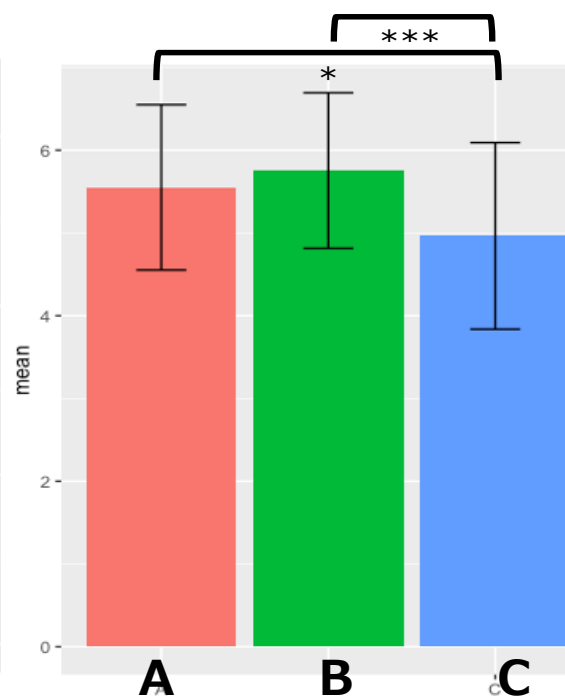
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

多重比較検定 (私的交通利用者)

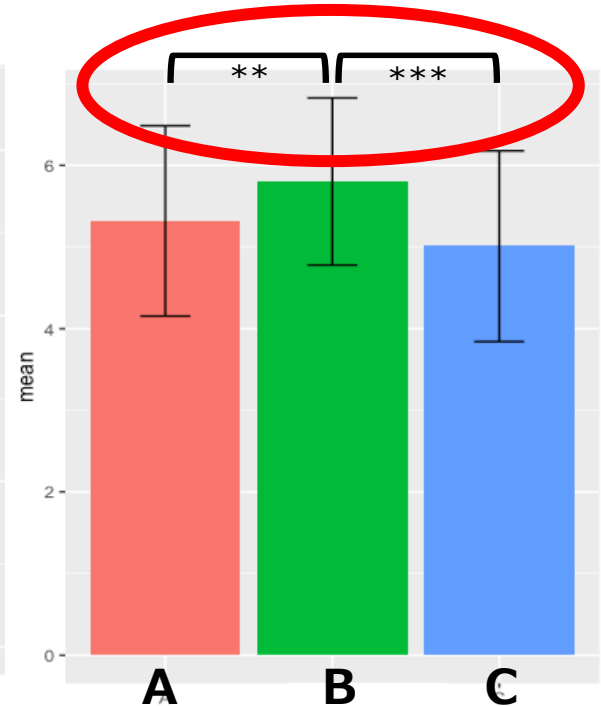
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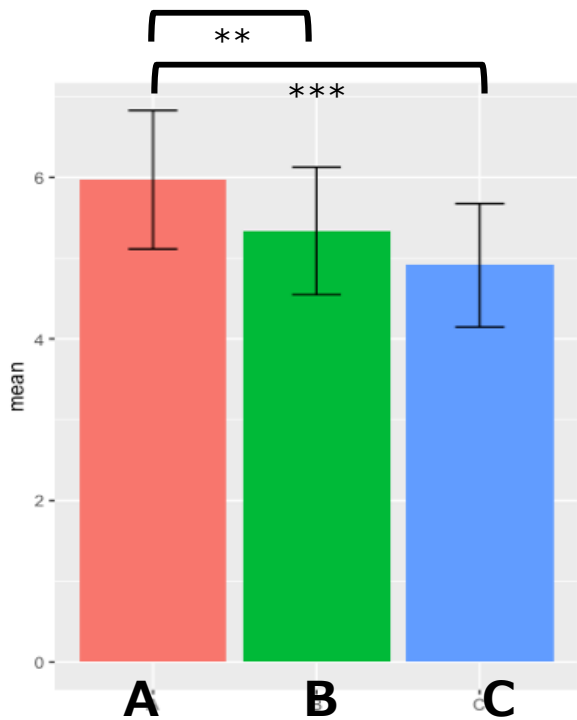


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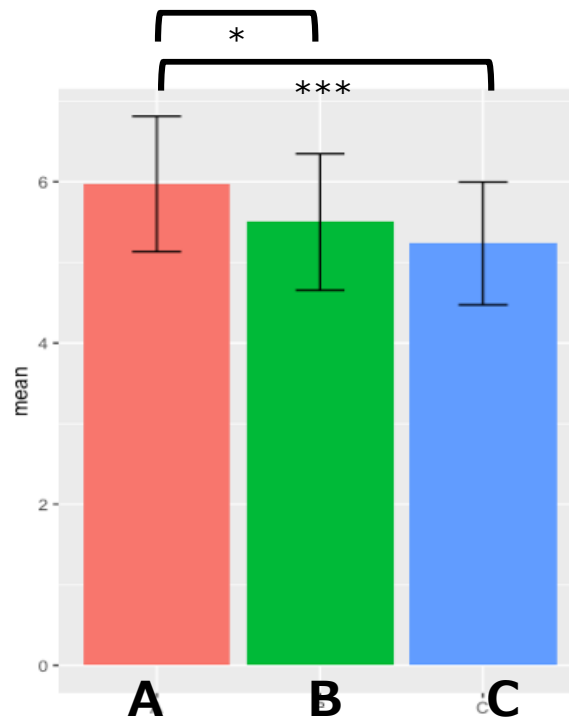
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多重比較検定 (パトランジット利用者)

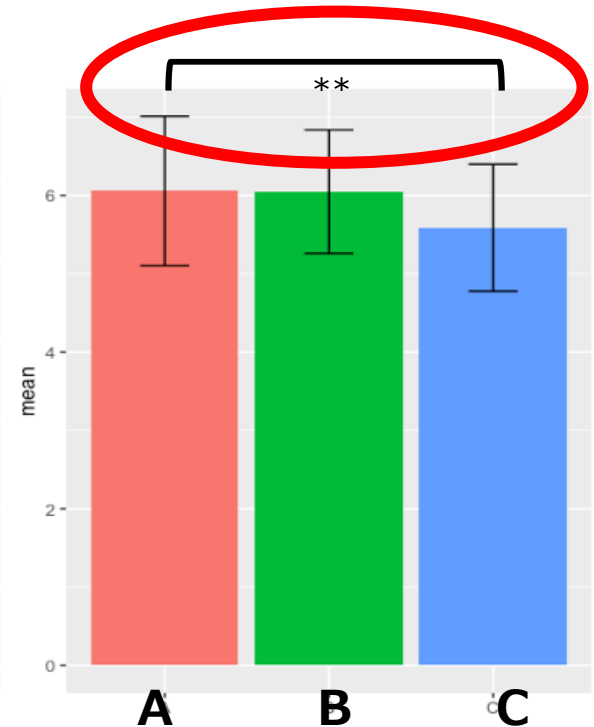
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行動意図
「協力行動をしよう」

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構造方程式モデリング

仮説した心理指標同士の因果関係を確認する

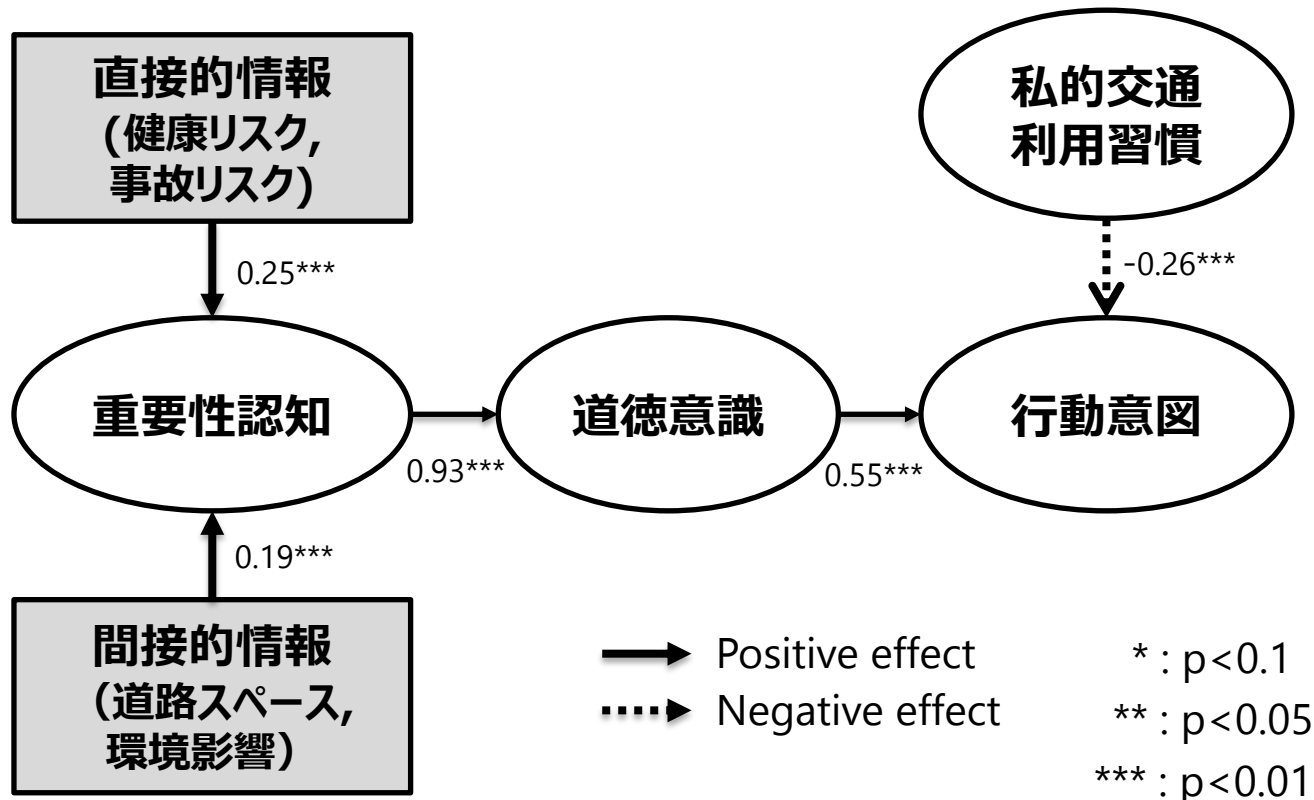
構造方程式モデリング

Log-likelihood: -6537

Chi-Square: 105.8***

RMSEA: 0.045

CFI: 0.977



結論

- 公共交通整備前段階においても、動機付け情報の提供は重要性認知・道徳意識、更に行動意図に正の影響を与える
- 動機付け情報の効果は、主要利用交通手段によって異なる
 - ✓ 私的交通利用者：直接的情報がより効果的
 - ✓ パラトランジット利用者：間接的情報がより効果的

個人属性による違いはあるものの、動機付け情報の提供は、将来の公共交通に対する利用意識に影響を与え、円滑な公共交通整備に繋がる可能性

結論



課題

- ✓ 大学生のみを対象
- ✓ 動機付け情報の種類の少なさ
- ✓ 間接的・直接的という分類分けの曖昧性
- ✓ バンドンのみでの分析

→ **使用する動機付け情報の種類を拡大し、対象を広げ追加調査**



ご清聴ありがとうございました

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