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# Factor Analysis and Reliability of the Pro-Lockdown Compliance Scale

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Analisis Faktor dan Keandalan Skala Perilaku Pro-Lockdown

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**ABSTRACT**

A multilevel lockdown was introduced during the COVID-19 pandemic worldwide. This new experience, however, received mixed responses from the public in different countries including India. A quantitative self-report, the Pro-Lockdown Compliance Scale (Pro-LCS), was developed to help 1) the Government and enforcing agents understand the compliance level of the public and 2) researchers investigate the antecedent factors of the compliance of the lockdown measures. The initial 10 items were administered to 309 male residents in Kerala via an online survey. The responses were randomly divided and submitted to exploratory and confirmatory factor analyses. Both analyses consistently support that the scale is best represented by a 5-item unidimensional model. Moreover, the Pro-LBS also demonstrated adequate internal consistency. The preliminary findings suggest that the scale is a brief and useful tool to examine the compliance level of the lockdown measures.

**Original Article**

**ABSTRAK**

Lockdown bertingkat diberlakukan selama pandemi COVID-19 di seluruh dunia. Namun, pengalaman baru ini mendapat tanggapan beragam dari masyarakat di berbagai negara termasuk India. Laporan mandiri kuantitatif, Skala Kepatuhan Pro-Lockdown (Pro-LCS), dikembangkan untuk membantu 1) Pemerintah dan aparat penegak hukum memahami tingkat kepatuhan publik dan 2) peneliti menyelidiki faktor-faktor yang mendahului kepatuhan terhadap penguncian Pengukuran. 10 item awal diberikan kepada 309 penduduk laki-laki di Kerala melalui survei online. Tanggapan secara acak dibagi dan diserahkan ke analisis faktor eksplorasi dan konfirmasi. Kedua analisis secara konsisten mendukung bahwa skala paling baik diwakili oleh model unidimensional 5 item. Selain itu, Pro-LBS juga menunjukkan konsistensi internal yang memadai. Temuan awal menunjukkan bahwa skala adalah alat yang singkat dan berguna untuk memeriksa tingkat kepatuhan tindakan penguncian.

## 1. Introduction

More than half of the World's population was on lockdown (BI India Bureau, 2000, Sandford & Euronews 2020) during April 2020 to contain the rapid-spreading Corona Virus. Consequently, human interaction and economic activities were restricted and resulted in unemployment or wage reduction (The Lancet, 2020).

Health precautions were important to avoid COVID-19. However, people still went to public places when they had (essential or very essential) responsibilities. The psychological reasons that led to the violation of lockdown restrictions may be optimism bias (McColl et al., 2021) or a general tendency to give importance to the cost of precautions than their benefits (Weinstein, 1987). Moreover, there were reports that some individuals, due to the boredom and resentment against law enforcement bodies-imposed restriction of personal freedom, went against the lockdown regulations through protests, violations of the restrictions, and panic buying (BBC News, 2020; Andone, 2020; Porto et al. 2022). In densely populated areas the resistance of public was high (Hills & Eraso, 2021), for example India. The resistance to the lockdown restriction not only led to the spread of coronavirus but also delayed the recovery from the pandemic (Outlook News, 2021) Researchers began to identify factors that played a role in

compliance with the restrictions. For instance, Bellato (2020) proposed three psychological factors namely empathy, positive mood, and social influence as useful to encourage the public to maintain social distancing, wear face masks in public areas, and follow personal hygiene measures. Similarly, Clark and colleagues (2020) conducted a study involving 8,317 participants from 70 countries to examine the extent to which several beliefs and attitudes (e.g., perceived invulnerability to COVID-19, the likelihood of a disruptive experience of getting COVID-19, personal health importance, confidence in health care precautions related to COVID-19, perceived efficacy of practicing social distancing, and confidence in government in managing COVID-19) in predicting compliance behaviours during COVID-19 related lockdowns such as rule-following behaviours, protective health behaviours, and tendency to give health recommendation to others. The researchers found that faith in health measures to avoid COVID-19 significantly predicted all three outcome variables.

**The Present Study**
The strict lockdown measures implemented by the law enforcement departments and the local authority in Kerala, India were equally welcomed and criticised. A measurement tool of the compliance of the public towards lockdown measures was felt important to know more about the compliance level of the public. Moreover, the results would be useful for recommending modification of the lockdown enforcement measures to address the needs of the public.

The need for such a measurement was also recognized by other researchers before and after the pandemic - Covid-19. But only few attempts were made. Clark et al. (2020), for instance, used the Covid-19 Questionnaire that consisted of three subscales namely, rule-following behaviours, protective health behaviours, and tendency to give health recommendations to others. However, Clark and colleagues did not report the factorial structure and psychometric properties of the scale. More importantly, the scale did not address the proactive element of compliance and gave relatively less emphasis on compliance to lockdown behaviours. Another attempt was done by An et al (2021) by developing Social Distance Attitude scale. But the focus of the scale was only attitude towards observing social distancing (relevance and efficacy of measures) and it does not address the compliance level of individuals.

There were instances in the past-before Covid-19, during which people were not ready to comply with quarantine restrictions related to plague, SARS, flu, cholera and so on (Risse, 1992; Markel, 1995; DiGiovanni et al., 2004; Blendon et al., 2006). But studies are limited to examine the compliance level and its correlates. One of the major reasons for limited studies on compliance towards Covid-19 lockdown measures was lack of

assessment tools which were short, but relatively comprehensive to represent compliance level. Therefore researchers such as Lonergan and Chalmers (2020) and Kissler et al (2020) have appealed for public compliance tool towards pandemic in future contexts. Thus, to address the need for examining the compliance level of the public to the lockdown regulations and policies, the Pro-Lockdown Compliance Scale (Pro-LCS), a quantitative measurement was developed in the present study. Psychometric qualities (e.g., factorial structure and reliability) of the Pro-LCS were also examined.

The scale is based on the Civic Engagement Model which claims that an adaptive social contract exists between individual and society (Lerner et al., 2014). According to the model, through positive and active engagement, the individual supports the social world and it is a mutually beneficial relationship. The civic engagement behaviour of individual is based on his civic knowledge, civic ideology and civic actions. The benefits of civic engagement behaviour will be returned to individual in the form of social safety and social cultural environment which nurture growth of individual. In the context of the lockdown restrictions, the individuals were expected to understand the consequences of spread of pandemic and benefits socially responsible actions like compliance with lockdown restrictions; to imbibe the ideology that collective actions will help to thrive the challenges brought by the pandemic; and to take actions by following the lockdown regulations and directions by the government. Moreover, though there were strict regulations regarding precautionary actions to be followed by the citizens, an engaged citizen, rather than just comply with the rules, also actively engaged in behaviour that helped to increase the success of the governmental rules, realizing that it was a mutually beneficial relationship, and s/he had to actively contribute through his compliance as well as pro- lockdown actions – such ensuring there is no panic buying, actively planning to reduce travel, appreciating and supporting the authorities who created rules for the public good.

## 2.    Methods

**Participants**
A total of 309 males ($M_{age}$ = 35.87, *SD* =14.84, 3 missing values) were recruited from Whatsapp community groups using the convenient sampling method. We focused on males because in patriarchal societies like Kerala, males take up the major responsibilities, especially those involving things outside the home. During the core lockdown period during April to June 2020, it was primarily males who ventured out from the safety of the homes, either to buy essentials or for any other emergencies. Hence only men were recruited for the study since the items of the study would be more applicable to them as it dealt with the frequency of going out, maintaining social distance while going out, etc.

**Table 1. Demographic Details of Participants (N=309)**

| | Items | *n* | % |
|---|---|---|---|
| Educational status | Senior Secondary | 49 | 15.9 |
| | Undergraduate | 66 | 21.4 |
| | Postgraduate | 146 | 47.2 |
| | Doctoral Degree | 48 | 15.5 |
| | Total | 309 | 100.0 |
| Marital status | Unmarried | 140 | 45.3 |
| | Married | 156 | 50.5 |
| | Divorce | 13 | 4.2 |
| | Total | 309 | 100.0 |
| Occupation | Student | 82 | 26.5 |
| | Employed | 112 | 36.2 |
| | Self employed | 70 | 22.7 |
| | Business | 42 | 13.6 |
| | Unemployed | 1 | 0.3 |
| | Retired | 2 | 0.6 |
| | Total | 309 | 100.0 |
| Living Location | Rural | 39 | 12.6 |
| | Semi urban | 120 | 42.1 |
| | Urban | 68 | 22.0 |
| | City | 72 | 23.3 |
| | Total | 309 | 100.0 |

Most of the participants were postgraduate students (47.25%), married (50.49%), employed (36.25%), and living in semi-urban (42.07%) (see Table 1 for details). Participants completed a Google-form-based survey voluntarily from 6th May to 26th June 2020 during the last seven weeks of the national wide lockdown in India. The informed consent was obtained from all participants.

**Measures**

*Pro-lockdown Compliance Scale (Pro-LCS)*
The Pro-LCS is a brief tool to measure complaint behaviours during the full lockdown. The first two authors developed 10 items in English to reflect the compliance behaviours of people during the lockdown; and translated them into Malayalam language using forward-backward translation. The items were rated on a 5-point Likert scale (1= strongly disagree, 5= agree strongly). Higher total scores indicate a higher level of proactive attitude to compliance to rules and regulations related to a lockdown used to contain any virulent, fast spreading infections.

The individual items in the Pro-LCS were generated based on a working paper submitted by Hale and Colleagues (2020) from University of Oxford. They have reviewed and compared the measures introduced by various governments. The measures were taken on matter such as movement of people, economic activities and health. The lockdown restrictions were primarily focused on home containment and limited number access to public places. The authors of the present scale also referred media reports and journal articles (Porto et al., 2022; Jalal & Sen, 2020; Outlook News, 2021; India Today Webdesk, 2021) to examine the response of public towards these measures. The proactive nature of lockdown compliance of an individual brought to the scale based on the Civic Engagement Model (Lerner et al, 2014). All the items in the scale reflect the proactive level of compliance by the individual respondent. For example: item (1) *I restricted myself going public places the most when the need is avoidable;* and item (10) *I try to understand the lock-down instructions given by authorities so that I can effectively follow them*.

**Data Analysis**
The data were randomly split into exploratory (n = 154) and confirmatory (n = 155) samples. The former was submitted to exploratory factor analysis (EFA) using JASP 0.16.3 (JASP Team, 2022), while the latter was submitted to confirmatory factor analysis (CFA) with robust maximum likelihood (MLR) estimation using Lavaan R-package (Version 0.6-11; Rosseel, 2012) of the statistical software R (4.2.0 for Windows; R Core Team, 2022). A good fit model is characterized by comparative fit index (CFI) and Tucker-Lewis Index (TLI) $\geq$ 0.95, root mean square error of approximation (RMSEA) $\leq$ 0.05, standardized root mean square residual (SRMR) < 0.08, and the ratio of chi-square value to degrees of freedom ($\chi2/df$) < 3. When a model is acceptable (i.e., CFI and TLI > 0.90, RMSEA < 0.08), modification indices are referred to improve it.

Reliability was estimated using Cronbach alpha ($\alpha$) and McDonald Omega ($\omega$). The compRelSEM function (semTools R-package Version 0.5-6; Jorgensen et al., 2022) was used to estimate the composite reliability (CR).

## 3.   Results

**Exploratory Factor Analysis**
EFA results with Parallel analysis, principal axis factoring estimation, and Promax rotation suggested a two-factor solution, and the items are suitable for factor analysis: Kaiser-Meyer-Olkin (KMO) test = 0.839, Bartlett's test ($\chi^2$ [36]) = 734.750, *p* < 0.001. Item 2 was found to have factor loading below 0.40 and was removed. Submitting the remaining 9 items to another EFA also found a two-factor analysis. Next, we explored a single-factor model by fixing the number of factors to one. Two items (items 7 and 8) with factor loading < 0.40 were removed. Analysis (without rotation) on the remaining 8 items showed that the model was not satisfactory. Therefore, we extracted the five items with the highest factor loading and submitted them to another EFA. Parallel analysis suggested a unidimensional model that explained 43.50% of the total variance. Table 2 summarizes the results and factor loading for the three models. Although the 2-factor

**Table 2. Summary of Exploratory Factor Analysis on the 5-item Pro-Lockdown Compliance Scale**

| Item | Two-factor model (9 items) | | One-factor model (8 items) | One-factor model (5 items) |
|---|---|---|---|---|
| | Factor 1 | Factor 2 | | |
| 1. I restricted myself from going to public places when the need was avoidable | **0.645** | 0.084 | 0.631 | 0.723 |
| 2. I limited using essential so that I don't have to go for buying things very often | NA | NA | NA | NA |
| 3. I planned well so that I had to go outside for buying things only limited number of times | **0.721** | 0.004 | 0.602 | 0.688 |
| 4. I restricted myself from panic buying knowing that my behaviour will lead others to do the same | 0.091 | **0.544** | 0.541 | NA |
| 5. I was a model for my friends, neighbors, and family members in the observance of social distancing | **0.556** | 0.016 | 0.478 | 0.540 |
| 6. I purposefully encouraged others to follow social distancing instructions. | 0.032 | **0.644** | 0.559 | NA |
| 7. I helped others by sharing things/ buying things so that they can avoid going to public places | **0.539** | –0.120 | NA | NA |
| 8. I encouraged others not to do panic buying | –0.178 | **0.736** | 0.441 | NA |
| 9. I profoundly appreciate or keep great regard for the police force and government officials who enforce social distancing among the public | **0.612** | 0.099 | 0.605 | 0.678 |
| 10. I try to understand the lock-down instructions given by authorities so that I can effectively follow them | 0.091 | **0.629** | 0.624 | 0.464 |
| Total Explained Variance | 0.410 | | 0.318 | 0.392 |
| Cronbach alpha (McDonald Omega) | 0.754 (0.756) | 0.734 (0.735) | 0.784 (0.785) | 0.748 (0.751) |
| Tucker-Lewis Index (TLI) | 0.981 | | 0.723 | 0.996 |
| RMSEA [90% Confidence Interval] | 0.031 [0.000, 0.081] | | 0.132 [0.101, 0.166] | 0.018 [0.000, 0.115] |
| Bayesian information criterion (BIC) | –73.675 | | –26.695 | –19.908 |

*Note*. $N$ = 154. Factor loading above 0.40 in the two-factor model was bolded. NA = Not applicable, the item was removed due to low factor loading. RMSEA = root mean square error of approximation.

**Table 3. Goodness-of-fit Indices for the 5-item Pro-Lockdown Compliance Scale Malayalam Version**

| | Model | $\chi^2$ | df | $\chi^2/df$ | CFI | TLI | RMSEA [90% CI] | SRMR |
|---|---|---|---|---|---|---|---|---|
| 1 | One-factor (10 items) | 91.486*** | 35 | 2.61 | 0.821 | 0.769 | 0.102 [0.080, 0.124] | 0.088 |
| 2 | One-factor (8 items) | 51.428*** | 20 | 2.57 | 0.880 | 0.832 | 0.101 [0.072, 0.130] | 0.082 |
| 3 | One-factor (5 items) | 15.134* | 5 | 3.03 | 0.940 | 0.880 | 0.114 [0.056, 0.177] | 0.048 |
| 3a | One-factor (5 items)[a] | 2.833 | 4 | 0.71 | 1.00 | 1.02 | 0.000 [0.000, 0.093] | 0.020 |
| 4 | Two-factor (9 items) | 61.651*** | 26 | 2.37 | 0.876 | 0.829 | 0.094 [0.067, 0.122] | 0.079 |

*Note*. $N$ = 155. The reported indices were based on robust values corrected in accordance with the MLR estimator. CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root-mean-square error of approximation, CI: confidence interval, SRMR = standardized root mean square residual.
[a] Residual covariance was added between items 3 and 5.
* $p < 0.05$, *** $p < 0.001$.

**Table 4. Descriptive Statistics and Intercorrelation of the Pro-Lockdown Compliance Scale Items.**

| Item | *M* | *SD* | Skew[a] | Kurto[b] | 1 | 2 | 3 | 4 | Avg inter-item Corr | Item-Total Corr |
|------|-----|------|---------|----------|---|---|---|---|---------------------|-----------------|
| 1. Item 1 | 4.21 | 0.85 | −1.310 | 2.410 | 1 | | | | 0.458 | 0.611 |
| 2. Item 3 | 3.73 | 1.00 | −0.674 | 0.119 | 0.483*** | 1 | | | 0.437 | 0.574 |
| 3. Item 5 | 3.50 | 1.02 | −0.395 | −0.221 | 0.397*** | 0.495*** | 1 | | 0.422 | 0.556 |
| 4. Item 9 | 3.76 | 1.08 | −0.612 | −0.391 | 0.501*** | 0.423*** | 0.460*** | 1 | 0.454 | 0.603 |
| 5. Item 10 | 3.70 | 1.05 | −0.520 | −0.331 | 0.449*** | 0.347*** | 0.337*** | 0.432*** | 0.391 | 0.505 |

*Note.* *N* = 309. M= Mean; SD = Standard deviation; Skew = Skewness; Kurto = Kurtosis; Avg inter-item Corr = Average inter-item Correlation; Item-Total Corr = Corrected item-total Correlation.
[a] Standard error = 0.139; [b] Standard error = 0.276.
*** $p < 0.001$

model and the 5-item unidimensional model are acceptable, the latter is preferable for two reasons. First, compared to the unidimensional model, the 2-factor model is less justified because the conceptual distinction between the items of the two factors is not clear. Second, TLI, RMSEA, and Bayesian information criterion (BIC) indicated that the unidimensional model outperforms the 2-factor model.

**Confirmatory Factor Analysis**
Although the 5-item unidimensional model is preferable, it is essential to further examine its acceptability. Therefore, CFA was conducted on the confirmation sample to compare the following models: the initial 10-item one-factor model (Model 1), the 8-item one-factor model (Model 2), the 5-item one-factor model (Model 3), and the 9-item two-factor model (Model 4). Table 3 summarizes the CFA results. Model 1, Model 2, and Model 4 showed poor fit, while Model 3 was found acceptable. A residual covariance was added between items 3 and 5 as suggested by the modification indices. The modified model (Model 3a) showed an excellent fit. The unstandardized factor loadings of the five items ranged from 0.584 (item 3) to 0.805 (item 9) and were all statistically significant (*p*s < 0.001). The 5-item Pro-LCS showed adequate reliability: CR = 0.782, α = 0.819, ω = 0.782.

Descriptive statistics, intercorrelation, average inter-item correlation, and corrected item-total correlation of the items (for the entire sample) are presented in Table 4. The five items were positively correlated with each other at the 0.001 level. The correlation coefficients ranged from 0.337 (between item 5 and item 10) to 0.501 (between item 1 and item 9). The average inter-item correlation coefficients ranged from 0.391 to 0.458 and are within the suggested range of 0.15 and 0.50 (Clark & Watson, 1995). Likewise, the corrected item-total correlation values ranged from 0.505 to 0.611 and are within the suggested range of 0.30 to 0.70 (de Vaus, 2004). The results indicate that the five items are

measuring the same construct and they do not overlap with each other.

## 4.  Discussion

When Lockdown measures were introduced by Governments, collective, voluntary, and proactive support was expected from the public to contain the pandemic collectively. The present study developed the Pro-lockdown Compliance Scale (Pro-LCS) and examined its factorial structure and internal consistency.

The finalized version of the Pro-lockdown Compliance Scale consists of five items. The five items (items 1, 3, 5, 9, and 10) assess how people respond to the lockdown measures during the pandemic. In densely populated societies, these measures mentioned in the selected items can help reduce the rapid spreading of pandemics such as COVID-19 and other respiratory pandemics. Measures beyond have been found to be highly restricting human life, especially in highly populated areas (Hills & Eraso, 2021). The evolved items are specifically related to lockdown and check compliance and the proactive response of people towards lockdown. For example, both items 3 ("*I planned well so that I had to go outside for buying things only limited number of times*") and 5 ("*I was a model for my friends, neighbors, and family members in the observance of social distancing*") tap onto the two main behaviours to practice during the lockdown. As a result, our participants perceived the two items are conceptually similar with each other and the analysis result suggested adding an error covariance between them.

The item contents of the other five items excluded are careful/limited use of resources (item 2), refraining from panic buying (item 4), encouraging others to observe social distancing (item 6), sharing resources to avoid crowding in public places (item 7), and encouraging other for not doing panic buying (item 8). These five

excluded items have a lower, direct connection with lockdown compliance than the five included items (Hale et al., 2020). For example, item 4 ("*I restricted myself from panic buying knowing that my behaviour will lead others to do the same*") is about limiting the use of existing resources. The restriction of panic buying aims to avoid a shortage of daily supplies during the lockdown and hence it is not directly related to lockdown measures. In a comparative study on lockdown measures taken by various governments globally, it was found that the measures included closing of schools, shops, work places, restricting public gathering, stopping of public transport facilities, instructions to stay at home, restricting internal movement and restriction on international travel (Hale et al., 2020).

Our results showed that the Pro-LCS is unidimensional and has adequate internal consistency. Though the scale was tested only on men, based on its psychometric properties, we believe it can be used by both genders in societies or situations where both are equally involved. It can be used to examine the level of public adherence to lockdown restrictions. Although the lockdown measures have been eased in most countries, researchers can invite participants to answer the Pro-LCS retrospectively along with measures of psychological, social, and cultural factors to identify the potential correlates of pro-lockdown compliance behaviours. The results are helpful for the introduction of similar policies (e.g., reduction of energy consumption) in the future.

Although the preliminary findings are promising, they shall be interpreted with caution because of two major limitations. First, the psychometric qualities of the 5-item Pro-LCS remain open. Note that all participants answered the initial 10 items of the scale. There is a possibility that the excluded items confound participants' perceptions of the retained items. Moreover, the present study only investigated the factorial validity and internal consistency of the scale. We did not examine the test-retest reliability and validity of the scale due to the difficulty to collect data. People were bombarded by many online surveys during the national wide lockdown period. As a result, we had to limit the number of items and give up requesting participants to answer the survey again to collect at least 300 responses. Second, the present study only included male residents in Kerala due to their role in handling the major responsibilities. Moreover, the relatively small sample size not only causes some model fit statistics exceeded the acceptable range (e.g., TLI > 1.0 in Model 3a) but also limits the generalizability of the findings. To address the limitations, further investigations using the longitudinal design on a larger sample consisting of both genders and different cultural groups are needed to further verify the psychometric qualities such as test-retest reliability and predictive validity of the Pro-LCS. Future

researchers are also recommended to conduct item analysis to examine the item characteristics (e.g., difficulty level).

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