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Illness Perception Does Not Predict Telemedicine Adoption Among Students at a Private University in Indonesia: A Cross-Sectional Study

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ABSTRACT:

Objective: To examine the relationship between illness perception and telemedicine adoption among university students at a private institution in Surabaya, Indonesia.

Material and Methods: This cross-sectional study recruited 121 active university students through purposive sampling. Illness perception was measured using a 12-item instrument adapted from the Brief Illness Perception Questionnaire (B-IPQ), framed around a hypothetical illness scenario, while telemedicine adoption was measured using a 3-item behavioural intention scale adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT). Data were analysed using Spearman's rank correlation, with statistical significance set at $p < 0.05$.

Results: The mean illness perception score was 38.14 (SD = 7.23), with 61.2% of respondents falling in the moderate category. Telemedicine adoption was skewed toward high levels, with 65.3% of respondents categorised as high adopters (mean = 11.43/15, SD = 2.48). Spearman's correlation returned $r = 0.166$ ($p = 0.069$), indicating no statistically significant association between the two variables. The achieved post-hoc power was 44.4%, with a minimum detectable effect of $r = 0.252$ at 80% power.

Conclusion: Illness perception was not a significant predictor of telemedicine adoption in this sample. Digital health promotion strategies targeting Indonesian young adults

should prioritise technology-oriented and social determinants over illness cognition alone. Multi-site studies using larger samples are needed to confirm these findings.

INTRODUCTION

The COVID-19 pandemic fundamentally disrupted health systems worldwide, including Indonesia's, driving an unprecedented shift toward digital health services.^{1,2} Telemedicine emerged as a primary means of sustaining continuity of care under conditions of restricted physical access,³ and its uptake in Indonesia was particularly dramatic. During the pandemic, the total number of telemedicine users in Indonesia surged from approximately four million to more than fifteen million, while visits to telemedicine platforms increased by as much as 600%.⁴⁻⁷ The Indonesian government launched the TEMENIN programme to extend remote consultation to hospitals and community health centres, and post-pandemic evidence suggests this momentum has been sustained, with approximately 81% of users expressing willingness to continue.⁸⁻¹⁰

Despite this growth, telemedicine adoption in Indonesia remains uneven and is shaped by factors that extend well beyond infrastructure and access. A substantial body of research has identified technology-oriented constructs as the primary drivers of adoption. The Technology Acceptance Model (TAM) positions perceived usefulness and perceived ease of use as the central determinants of technology adoption behaviour,^{11,12} and systematic reviews of telemedicine acceptance research have consistently found TAM-based constructs to outperform classical behavioural models in predictive power.^{13,14} In the Indonesian context specifically, studies have identified perceived usefulness, self-efficacy, and facilitating conditions as the dominant predictors of telemedicine adoption intention, with technology-centric variables explaining a substantial proportion of variance in behavioural outcomes.^{15,16} Social influence has also emerged as a recurrent predictor across multiple Indonesian studies, including research on millennials in Bali, Gen-Z and millennial users of Alodokter, and m-health users in Semarang,¹⁷⁻¹⁹ a finding that carries particular relevance in Indonesia's collectivistic cultural context where health-seeking decisions are often shaped by family and peer endorsement rather than individual deliberation alone.

A theoretically distinct perspective is offered by the Common-Sense Model of Self-Regulation (CSM), which conceptualises illness perception as the set of cognitive and emotional representations individuals hold about illness, encompassing beliefs about its identity, timeline, consequences, personal control, and emotional response.²⁰ These illness cognitions have been shown to shape health-seeking behaviour across a range of clinical populations,²¹ and a growing body of research has extended this logic to digital health contexts. Studies drawing on the Health Belief Model and related frameworks have found that health beliefs, including perceived severity, perceived benefits, and self-efficacy, predict adoption of telemedicine and health applications in diverse settings.²²⁻²⁴ This line of evidence has led researchers to theorise that illness cognition may serve as an upstream determinant of digital health-seeking, potentially shaping whether individuals choose to engage with telemedicine when health concerns arise.

However, the evidence for this relationship is less consistent than it may appear. Research examining illness cognition and digital health-seeking among healthy populations has yielded notably weaker effects. A representative survey in Germany found that perceived knowledge insufficiency, a cognitive appraisal closely related to illness concern, did not significantly predict online health information-seeking intention among healthy individuals, despite being a significant predictor among those who were ill.²⁵ A longitudinal study on cyberchondria similarly found no consistent positive association between health anxiety and online health-seeking at the between-individual level, with the relationship emerging only as a within-individual temporal pattern.²⁶ These findings suggest that illness-related cognitions may function differently in healthy populations, where the absence of active illness experience may attenuate the motivational salience of such beliefs. Most prior studies that found meaningful effects of health beliefs on digital health-seeking were conducted in clinical populations or among individuals with chronic conditions, raising the question of whether these findings generalise to healthy young adults who engage with telemedicine primarily as a preventive or convenience-driven channel rather than as a response to acute illness.

University students represent a theoretically important test case for this question. As a population characterised by high digital literacy and habitual use of online health information,²⁷ young adults are well-positioned to adopt telemedicine on the basis of technological familiarity alone, potentially rendering illness-specific cognitions less consequential. Research among Indonesian university students has found that telemedicine willingness is shaped primarily by factors such as trust and information access,²⁸ while the broader Indonesian literature consistently identifies lack of trust as the primary barrier to adoption.²⁹ These findings are consistent with a TAM-dominant account of adoption in this demographic. Yet whether illness perception plays any

meaningful role alongside these technological factors remains an open empirical question that has not been directly tested in the Indonesian student population.

The present study addresses this gap by empirically examining the relationship between illness perception and telemedicine adoption among university students at a private institution in Surabaya, Indonesia. Research on telemedicine adoption in Indonesia has disproportionately originated from elite public universities and major metropolitan hospitals, with institutions such as Universitas Indonesia and Universitas Gadjah Mada accounting for the largest share of published work in this area.³⁰ This concentration means that the experiences of students enrolled at non-elite private institutions remain largely absent from the literature, despite the fact that such students represent the majority of Indonesian higher education enrolment. National data show that more than 52% of all university students in Indonesia are enrolled in private institutions,³¹ making this group the numerically dominant yet empirically underrepresented segment of the student population. The present study offers preliminary evidence from this underrepresented context, using the Brief Illness Perception Questionnaire to measure illness cognition and a behavioural intention scale adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT) to assess telemedicine adoption. The findings are intended to contribute to a more empirically grounded understanding of what drives telemedicine engagement among Indonesian young adults, with implications for how digital health interventions are designed and targeted in similar institutional settings.

METHODS

This study employed an analytical observational design with a cross-sectional approach to examine the relationship between illness perception and telemedicine adoption among university students at a private institution in Surabaya, Indonesia. Illness perception served as the independent variable and telemedicine adoption as the dependent variable. The cross-sectional design was selected as appropriate for an exploratory study of this nature, where the primary aim was to establish whether an association exists between the two constructs rather than to infer causality.

Participants were recruited through purposive sampling from the student population of a single private university. The inclusion criteria required that respondents were active students with at least basic familiarity with telemedicine services, ensuring that all participants could engage meaningfully with the adoption-related items in the questionnaire. Recruitment began with an initial pool of 136 students, from which 15 were excluded for failing to meet the inclusion criteria, yielding a final analytical sample of 121 respondents. The minimum required sample size was calculated at 96 participants using the Lemeshow formula with a conservative assumed event proportion of 50%, and the achieved sample of 121 respondents exceeded this threshold. All eligible participants received a full explanation of the study purpose and provided written informed consent prior to data collection.

Data were collected through a self-administered questionnaire distributed both in person and via Google Forms between February and March 2025. Illness perception was measured using a 12-item instrument adapted from the Brief Illness Perception Questionnaire (B-IPQ) developed by Broadbent et al.,³² which is covering eight conceptual dimensions of illness cognition. The original B-IPQ was designed for use with clinical populations who have an active illness experience; however, precedent exists for adapting the instrument to healthy or non-clinical populations using hypothetical illness scenarios, including a validated version developed for use among healthy adults in Portugal³³ and an adaptation applied to a general adult population in the context of COVID-19 threat perception.³⁴ The present adaptation followed this approach, framing items in terms of a general hypothetical illness scenario to suit the healthy young adult sample. Each item was rated on a ten-point numerical scale, yielding a total score ranging from 12 to 60, with higher scores indicating more threatening illness perceptions. Validity testing confirmed that all 12 items met the item-total correlation threshold, with *r*-values ranging from 0.440 to 0.763 against an *r*-table critical value of 0.361. A reliability assessment of the full instrument returned a Cronbach's alpha of 0.942, indicating excellent internal consistency.

Telemedicine adoption was measured using a 3-item scale adapted from the Behavioural Intention subscale of the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al.,³⁵ with validation in the Indonesian context confirmed by Alviani et al.¹⁵ The three items assessed participants' intention to use telemedicine, willingness to continue using it, and likelihood of recommending it to others, each rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores were summed into a composite adoption score ranging from 3 to 15, with higher scores reflecting stronger behavioural intention to adopt telemedicine.

Data were analysed using IBM SPSS Statistics.³⁶ Univariate analysis was used to describe the distribution of both key variables, and bivariate analysis examined their association. Given the ordinal measurement level of both variables and the absence of a normal distribution, Spearman's rank correlation test was selected as the appropriate non-parametric analytic method,³⁷ with a pre-specified significance threshold of $p < 0.05$. To contextualise the magnitude of the observed correlation, effect size benchmarks established by Cohen³⁸ were applied, with coefficients below 0.10 classified as negligible, 0.10 to 0.29 as small, 0.30 to 0.49 as medium, and 0.50 and above as large. Ethical approval for the study was obtained from the Health Research Ethics Committee of Muhammadiyah University of Surabaya (reference number 028/KET/II.3/AU/F/2025).

RESULTS

Demographic Characteristics of Respondents

A total of 121 young adults from a private university in Surabaya were included in the final analysis. The sample was predominantly female, comprising 100 respondents (82.6%), with the remaining 21 (17.4%) being male. This distribution reflects the broader enrolment patterns of the participating faculties, particularly the Faculty of Medicine, which consistently attracts a higher proportion of female students in the Indonesian higher education context. Respondents ranged in age from 18 to 25 years, with a mean age of 20.9 years ($SD = 1.6$), and the 22-year age group was the most represented at 40 respondents (33.1%). The Faculty of Medicine contributed the largest share of participants at 97 respondents (80.2%), followed by Health Science (5.8%), Engineering (5.0%), Education (4.1%), Dentistry (2.5%), Psychology (1.7%), and Business and Economics (0.8%). The substantial overrepresentation of medical students is a contextually significant characteristic of this sample, as students in medical programmes are more likely to have prior exposure to health-related concepts, including illness perception frameworks, compared to peers from non-health disciplines. This faculty composition should be considered when interpreting the generalisability of the findings. The complete demographic profile of the sample is presented in Table 1.

Table 1. Demographic characteristics of respondents (n = 121)

Characteristic	Category	Frequency	Percentage (%)
Gender	Female	100	82.6
	Male	21	17.4
Age	18 years old	5	4.1
	19 years old	18	14.9
	20 years old	24	19.8
	21 years old	19	15.7
	22 years old	40	33.1
	23 years old	11	9.1
	24 years old	2	1.7
	25 years old	2	1.7
Faculty	Medicine	97	80.2
	Dentistry	3	2.5
	Business and Economics	1	0.8
	Health Sciences	7	5.8
	Education	5	4.1
	Psychology	2	1.7
	Engineering	6	5.0

Illness Perception and Telemedicine Adoption Among Respondents

Illness perception was assessed using the 12-item instrument adapted from the Brief Illness Perception Questionnaire,³² with total scores ranging from 12 to 60. The mean illness perception score was 38.14 (SD = 7.23), with individual scores spanning from 19 to 56. The majority of respondents fell within the moderate category, with 74 respondents (61.2%) scoring between 32 and 43, while 28 respondents (23.1%) demonstrated high illness perception with scores between 44 and 60, and 19 respondents (15.7%) scored in the low range between 12 and 31. This distribution suggests that most participants held moderately developed cognitive and emotional representations of illness when presented with hypothetical illness scenarios.

Telemedicine adoption was measured using the 3-item behavioural intention scale adapted from Venkatesh et al.,³⁵ with total scores ranging from 3 to 15. The mean adoption score was 11.43 (SD = 2.48), with individual scores ranging from 4 to 15. The distribution was markedly skewed toward higher adoption levels, with 79 respondents (65.3%) categorised as high adopters with scores between 12 and 15, 35 respondents (28.9%) in the moderate category with scores between 8 and 11, and only 7 respondents (5.8%) as low adopters with scores between 3 and 7. This pronounced skew toward the upper end of the scale is indicative of a ceiling effect in the adoption variable, where the concentration of scores near the maximum attenuates the observable variance in the dependent variable and consequently limits the statistical capacity to detect associations with other constructs. The descriptive profile of both variables is summarised in Table 2.

Table 2. Descriptive statistics for illness perception and telemedicine adoption (n = 121)

Variables	Category	Frequency	Percentage (%)	Mean	SD	Min	Max
Illness Perception ^a	Low	19	15.7	38.14	7.23	19	56
	Moderate	74	61.2				
	High	28	23.1				
Telemedicine Adoption ^b	Low	7	5.8	11.43	2.48	4	15
	Moderate	35	28.9				
	High	79	65.3				

^a Illness perception scores were categorised using tertiles of the possible range (12–60): low (12–31), moderate (32–43), and high (44–60).

^b Telemedicine adoption scores were categorised using tertiles of the possible range (3–15): low (3–7), moderate (8–11), and high (12–15).

Relationship Between Illness Perception and Telemedicine Adoption

Bivariate analysis using Spearman's rank correlation test was conducted given the ordinal measurement level of both variables and their non-normal distributional characteristics.³⁷ The analysis returned a correlation coefficient of $r = 0.166$ with a p-value of 0.069 (Table 3). As this value exceeds the pre-specified significance threshold of $p < 0.05$, the null hypothesis of no significant association between illness perception and telemedicine adoption was retained. Based on established benchmarks for interpreting correlation magnitude,³⁸ a coefficient of $r = 0.166$ falls within the small range, indicating that illness perception accounts for a very small proportion of the variance in telemedicine adoption scores.

Table 3. Spearman correlation between illness perception and telemedicine adoption (n = 121)

Variable	Correlation Coefficient (r) ^a	p-value ^b
Correlation between illness perception and telemedicine adoption	0.166	0.069

^a Correlation strength interpreted as: negligible (<0.10), small (0.10–0.29), medium (0.30–0.49), and large (≥ 0.50).

^b $p > 0.05$ indicates non-significance; achieved post-hoc power = 44.4%; minimum detectable r at 80% power = 0.252.

To contextualise this null finding, a post-hoc power analysis was conducted using Fisher's *z* transformation method. With $n = 121$, $r = 0.166$, and a two-tailed α of 0.05, the achieved statistical power was 44.4%, substantially below the conventional threshold of 80%. This indicates that the present study had a limited capacity to detect an effect of this magnitude as statistically significant. The minimum correlation coefficient detectable at 80% power given this sample size was $r = 0.252$, which falls at the lower boundary of the small-to-medium range according to Cohen's³⁸ benchmarks. The observed correlation of $r = 0.166$ falls below this threshold, suggesting that even if a genuine but small association exists between illness perception and telemedicine adoption in this population, the current study was insufficiently powered to detect it reliably. These results should therefore be interpreted with appropriate caution rather than as definitive evidence of no association.

DISCUSSION

This study examined the relationship between illness perception and telemedicine adoption among university students at a private institution in Surabaya, Indonesia. The central finding is that illness perception did not significantly predict telemedicine adoption within this sample, with a Spearman correlation coefficient of $r = 0.166$ and a *p*-value of 0.069.

Several studies grounded in the Common-Sense Model and Health Belief Model have demonstrated that illness cognition significantly predicted telemedicine adoption across clinical and community populations.^{21–24} On this basis, one might reasonably expect illness perception to function as a meaningful upstream driver of telemedicine adoption among young adults. The present findings do not support this expectation, and the pattern of evidence suggests this may be a contextually coherent outcome rather than an artefact of methodological limitations alone.

The null finding is consistent with emerging evidence that illness cognition operates differently in healthy populations compared to clinical ones. A representative survey conducted in Germany found that cognitive appraisals related to illness concern did not significantly predict online health information-seeking among healthy individuals, even though the same constructs were significant predictors in those who were ill.²⁵ A longitudinal study on health anxiety and online health-seeking similarly found no consistent positive association at the between-individual level among the general population, with meaningful relationships emerging only as within-individual temporal patterns.²⁶ Taken together, these findings suggest that when a person has no active illness experience, illness-related cognitions may lack the motivational salience needed to drive health-seeking behaviour in a consistent and detectable way.

Beyond the healthy-population dynamic, two methodological features of this study are likely to have further attenuated the detectable association. The first concerns the ceiling effect in the adoption variable. With 65.3% of respondents categorised as high adopters and a mean score of 11.43 out of 15, the restricted variance in the dependent variable reduced the statistical capacity to detect any association, regardless of its true magnitude in the broader population. The second concerns the hypothetical framing of the B-IPQ. Adapting illness perception items to a general hypothetical scenario, rather than a condition the participant is currently experiencing, introduces a layer of cognitive abstraction that may produce responses less tightly coupled to actual illness-driven decision-making.³² Participants without recent illness experience may engage with these items more as an abstract exercise than as a reflection of genuine health concern. While this adaptation follows established precedent,^{33,34} it remains a meaningful limitation.

The substantive interpretation that emerges from both the present findings and the parallel literature is that telemedicine adoption among healthy young adults is driven primarily by technology-oriented factors rather than illness-specific cognitions. Systematic reviews of telemedicine acceptance research have consistently demonstrated the superiority of TAM-based constructs over classical health behaviour models in predicting adoption intention.^{13,14} In the Indonesian context, perceived usefulness, self-efficacy, and facilitating conditions have been identified as the dominant predictors of telemedicine adoption intention across multiple studies,^{15,16} while health belief constructs were largely absent from these models. Among young Indonesians in particular, social influence has emerged as a recurrent and significant predictor of telemedicine adoption intention, including in studies focusing on millennials and Gen-Z users.^{17–19} This is consistent with Indonesia's collectivistic cultural orientation, where health-seeking decisions are frequently shaped by family and peer endorsement rather than by individual cognitive appraisals of illness.³⁹ A young person's decision to use telemedicine may be more contingent on social normalisation than on personal illness beliefs.

The present study also contributes to a broader concern about representational bias in the Indonesian digital health literature. Research on telemedicine adoption in Indonesia has disproportionately originated from elite public universities and large

metropolitan hospitals, with Universitas Indonesia and Universitas Gadjah Mada accounting for the largest share of published work.³⁰ Students at non-elite private institutions, who represent more than half of all university enrolments nationally,³¹ have been largely absent from this literature. The present study offers a preliminary empirical account from this underrepresented segment, and the high adoption intention observed in this sample suggests that telemedicine engagement is not confined to students at prestigious or research-intensive institutions. This finding has practical relevance for digital health policy, as it indicates that the appetite for telemedicine among Indonesian young adults may be broader and more evenly distributed across institutional types than the existing literature implies.

For health promotion and digital health policy, these findings suggest that efforts to increase telemedicine adoption among young adults should prioritise the practical and experiential dimensions of service use rather than illness awareness campaigns targeted at individual health cognitions. While health literacy remains a foundational asset for informed health behaviour,^{40,41} the present findings suggest it is insufficient as a standalone driver of adoption when practical and social barriers persist. Investment in platform reliability, interface design, data security, and social normalisation of telemedicine within peer and family networks are likely more consequential than illness awareness campaigns. Future research integrating social influence variables within a TAM or UTAUT framework would help establish the relative contribution of each construct to adoption intention.

Several limitations of this study warrant explicit acknowledgement. The single-site design and the overrepresentation of medical students, who comprised 80.2% of the sample, substantially limit the generalisability of these findings to other student populations or institutional contexts. The achieved power of 44.4% indicates the study was insufficiently powered to detect small effects reliably, as detailed in the Results. The hypothetical framing of the B-IPQ, while methodologically justifiable, introduces uncertainty about whether the illness perception scores reflect the kind of cognitions that would actually influence real-world telemedicine decisions. Future studies with larger, multi-site samples drawn from diverse institutional types, and ideally employing longitudinal designs that capture telemedicine use behaviour rather than adoption intention, would substantially advance understanding in this area.

CONCLUSION

This study set out to examine the relationship between illness perception and telemedicine adoption among university students at a private institution in Surabaya, Indonesia, with the aim of contributing to a more empirically grounded understanding of what drives telemedicine engagement among Indonesian young adults. The findings indicate that illness perception, as measured by the adapted Brief Illness Perception Questionnaire, did not significantly predict telemedicine adoption in this sample ($r = 0.166$, $p = 0.069$). This null finding is consistent with emerging evidence that illness cognition carries less motivational weight in healthy populations than in clinical ones, and aligns with the broader literature positioning technology-oriented factors as the primary drivers of adoption among digitally fluent young adults.

The high telemedicine adoption intention observed across this sample, including among students at a non-elite private institution, suggests that the appetite for digital health services among Indonesian young adults is not confined to students at prestigious or research-intensive universities. This is a practically meaningful finding given that such students constitute more than half of all university enrolments in Indonesia, yet have been largely absent from the existing digital health literature. Future research with larger, multi-site samples drawing on diverse institutional types, and incorporating social influence alongside illness cognition within an integrated behavioural framework, would strengthen the empirical foundation for understanding and promoting telemedicine adoption in this population.

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