Psychometric properties of the Motors of Mpox Vaccination Acceptance Scale among men who have sex with men

Chung-Ying Lin, Ching-Shu Tsai, Mark D. Griffiths, Chien-Wen Lin & Cheng-Fang Yen

Published online: 25 Nov 2024.

Submit your article to this journal ⬈

View related articles ⬈

View Crossmark data ⬈

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS

Check for updates

Psychometric properties of the Motors of Mpox Vaccination Acceptance Scale among men who have sex with men

Chung-Ying Lin[a,b,c,d]*, Ching-Shu Tsai[e,f]*, Mark D. Griffiths[g], Chien-Wen Lin[h,i], and Cheng-Fang Yen [h,i,j]

aInstitute of Allied Health Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan; bBiostatistics Consulting Center, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan; cDepartment of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan; dDepartment of Occupational Therapy, College of Medicine, National Cheng Kung University, Tainan, Taiwan; eDepartment of Child and Adolescent Psychiatry, Chang Gung Memorial Hospital, Kaohsiung Medical Center, Kaohsiung, Taiwan; fSchool of Medicine, Chang Gung University, Taoyuan, Taiwan; gSchool of Social Sciences, Nottingham Trent University, Nottingham, UK; hDepartment of Psychiatry, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan; iDepartment of Psychiatry, School of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan; jCollege of Professional Studies, National Pingtung University of Science and Technology, Pingtung, Taiwan

ABSTRACT

An outbreak of monkeypox (Mpox) appeared suddenly and rapidly spread worldwide during 2022. Men who have sex with men (MSM) are at a high risk of contracting Mpox compared to other cohorts. The present study examined the psychometric properties of a newly developed scale among MSM: the Motors of Mpox Vaccination Acceptance Scale (MoMVA) assessing cognitive components of the motivation to receive an Mpox vaccination. In total, 389 MSM participated in an online survey study. The factor structures of the MoMVA were first examined using exploratory factor analysis. After determining the factor structures, the MoMVA was further examined for: (i) internal consistency using Cronbach's α; (ii) concurrent validity using correlations with risk perception of contracting Mpox and intention to receive an Mpox vaccination; and (iii) known-group validity by comparing the scores of the MoMVA between MSM who vaccinated and those who did not. The results indicated that the MoMVA had a two-factor structure (positive and negative motors). The MoMVA had acceptable internal consistency (α = 0.793 to 0.914), concurrent validity (associated with intention to receive an Mpox vaccination), and known-group validity (participants who vaccinated had higher MoMVA scores than those who did not). The results of the present study indicated that the psychometric properties of the MoMVA were good and that they can be used for assessing cognitive components of the motivation to receive an Mpox vaccination among MSM.

PLAIN LANGUAGE SUMMARY

Men who have sex with men (MSM) are at a high risk of contracting Mpox compared to other cohorts. A reliable scale is needed to assess MSM's motivation to receive a vaccination against Mpox. The present study examined the psychometric properties of the Motors of Mpox Vaccination Acceptance Scale (MoMVA). In total, 389 MSM participated in an online survey study. It was found that the MoMVA contained the positive and negative motors to receive a vaccination. The MoMVA had acceptable internal consistency and significant association with intention to receive an Mpox vaccination. Participants who vaccinated had higher MoMVA scores than those who did not. The results of the present study indicated that the MoMVA measures MSM's motivation to receive a vaccination against Mpox well.

Introduction

Mpox is a viral illness caused by the monkeypox virus. In 2022, there was a global outbreak of Mpox worldwide.[1] Mpox continues to be a threat today, especially in the Democratic Republic of the Congo.[2,3] Common symptoms of Mpox are a skin rash or mucosal lesions accompanied by fever, headache, muscle aches, back pain, low energy and swollen lymph nodes.[4–6] Mpox can be transmitted through close contact with someone who has Mpox, with contaminated materials or with infected animals.[4–6] Therefore, although men who have sex with men (MSM) and individuals with human immunodeficiency virus (HIV) infection are at the high risk of contracting Mpox, everybody who closely contact with someone having Mpox has the chance to be infected.[4–6] Mpox is treated with supportive care for symptoms such as pain and fever, with close attention to nutrition, hydration, skin care, and prevention of secondary infections.[4–6] As of November 2023, there had been 355 confirmed cases of Mpox in Taiwan (where the present study was carried out), including one death.[7] The aforementioned statistics demonstrate that Mpox is an infectious disease that cannot be ignored in today's world.

The U.S. Food and Drug Administration approved a new vaccine (JYNNEOS®) containing an active attenuated vaccinia virus for the prevention of smallpox and Mpox infections for individuals in high-risk groups.[5] Several studies have found a high level of willingness to be vaccinated against Mpox among MSM in response to the scale of Mpox infection.[8,9] However, most previous studies have used a single question to evaluate participants' intention to receive an Mpox vaccination.[4–13] According to the cognitive model of empowerment (CME),[14] a proper scale assessing cognitive components of motivation to receive a vaccination could evaluate individuals' knowledge regarding vaccines, attitudes toward the value of receiving a vaccination, and confidence in deciding to receive a vaccination. Although some studies have tried to assess participants' intention to receive an Mpox vaccination by applying multiple questions,[15–17] there is still a lack of psychometric scales with evidence-supported psychometric properties to assess individuals' cognitive components of the motivation to receive an Mpox vaccination.

The Motors of COVID-19 Vaccination Acceptance Scale (MoVac-COVID19S),[18] which was developed based on the CME, incorporates four core cognitive components that determine individuals' motivation to be vaccinated against coronavirus disease 2019 (COVID-19), including values (i.e., how much an individual cares about the purpose of vaccination), impacts (i.e., how much an individual believes in the effectiveness of vaccination), knowledge (i.e., an individual's level of knowledge regarding vaccination), and autonomy (i.e., an individual's confidence and control over their decision to receive the vaccination).[18–20] Studies have verified that the MoVac-COVID19S has acceptable psychometric properties for assessing individuals' cognitive component affecting the motivation of receiving a vaccination among different populations.[21,22] Because of the need for a theoretically supported psychometric instrument to evaluate MSM's cognitive components affecting the motivation to receive a vaccination against Mpox, the present study adapted the MoVac-COVID19S into a new bespoke scale, namely the Motors of Mpox Vaccination Acceptance Scale (MoMVA) (see "Appendix") and evaluated its psychometric properties.

The present study aimed to examine the psychometric properties of the MoMVA among MSM. In addition to examining the factor structure and internal consistency, the present study also examined the concurrent validity of the MoMVA by testing its correlations with risk perception of contracting Mpox and intention to receive an Mpox vaccination, as well as the known-group validity by comparing the scores of the MoMVA across MSM with vaccination status, sexual orientation, and education level.

Methods

Participants

The method of recruiting participants has been described elsewhere.[23] In brief, the present study recruited participants by posting advertisements with the link to the research survey website on *Facebook, LINE*, and the *Professional Technology Temple* from November 1 to December 31, 2023. In 2024, the advertisement on *Facebook* had the potential to reach 16.95 million individuals in Taiwan, and the ratio of the *Facebook* advertisement reach vs. total population was 70.8%.[24] *Line* is the Taiwan's most used social media platform, and as many as 90.9% of Taiwanese individuals use *Line* for communication.[24] Both *Facebook* and *Line* are highly used by all age groups in Taiwan. The *Professional Technology Temple* is the largest terminal-based bulletin board system (BBS) for free bulletin messages and discussion, with more than 1.5 million registered users in Taiwan.[25] Due to the high use of these three online media platforms and BBS in Taiwan, the research recruitment messages used in the present study were able to reach the majority of MSM in Taiwan. The advertisement targeted *Facebook* users by location (Taiwan) and language (Chinese), where *Facebook's* advertising algorithm determined which users to show the advertisement to.

The study included Taiwanese men who were ≥20 years of age and who had engaged in sexual intercourse with men over the past year (i.e., MSM). The MSM who were willing to participate in the present study could press the "agree to participate" button in the advertisement and following informed consent could complete the survey. Those who were unwilling to participate in the study could press the "refuse to participate" button and leave. A total of 389 MSM voluntarily participated and completed the survey. Regarding the sample size of the participants for the study examining the psychometric propensity of a new-developed scale, both the item-to-sample ratio and the overall sample size were considered. First, according to Costello and Osborne, a 20-to-1 ratio has also been suggested.[26] Second, according to Comrey and Lee, a minimum of 300 participants is required for a good test of scale psychometrics.[27] There were 12 items in the MoMVA; therefore, at least 240 participants were needed based on the rule of thumb proposed by Costello and Osborne.[26] Considering that an overall sample size of more than 300 is required to reach a good level for psychometric testing,[27] a total of 389 participants in the present study met the requirements. The present study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital (KMUHIRB-EXEMPT(I)-20230008).

Measures

Mpox vaccination acceptance

The MoMVA was used to assess Mpox vaccination acceptance. To develop the scale, the research team replaced the word 'COVID-19' with 'Mpox' in the MoVac-COVID19S.[18] The 12-item MoMVA assesses individuals' perceived values, impacts, and knowledge of the Mpox vaccination and autonomy in deciding to receive an Mpox vaccination. Each item (see Appendix) is rated on a seven-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Three items in the MoMVA have negative wordings (higher scores on these three items indicate lower levels of motivation to get vaccinated) and are reverse scored, and nine items have positive wordings (higher scores on these nine items indicate higher

levels of motivation to get vaccinated). A higher summed score on the MoMVA indicates a greater motivation to get an Mpox vaccination.

Intention to receive an Mpox vaccination and vaccination status

To assess intention to receive an Mpox vaccination, participants were provided with a single item: *"Please rate your current willingness to receive an Mpox vaccination."* This item was rated on a 10-point scale ranging from 1 (*very low*) to 10 (*very high*). To assess vaccination status participants were asked *"Have you been vaccinated against Mpox?"* This item was responded either "no" or "yes."

Demographics

Participants were also asked some demographic questions including their age (in years), educational level (senior high school or below vs. college or above), and sexual orientation (gay vs. bisexual)

Data analysis

Descriptive statistics (means, standard deviations, frequencies, percentages, skewness, and kurtosis) were used to summarize the participants' characteristics and the item scores on the MoMVA). Regarding psychometric testing, the MoMVA was analyzed using (i) exploratory factor analysis (EFA); (ii) internal consistency with corrected item-to-total correlation; (iii) concurrent validity; and (iv) known-group validity.

Before conducting EFA using the extraction method of principal axis factoring, Kaiser–Meyer–Olkin test and Barlett sphericity test were firstly used to examine if the MoMVA data were suitable for factor analysis. When a Kaiser-Meyer-Olkin has a value >0.8 with a significant Barlett test, the data are suitable for EFA.[23,24] After ensuring the data appropriateness, Kaiser's rule for eigenvalues was used to decide the number of extracted factors (i.e., the number of factors having an eigenvalue >1) for the MoMVA.[25] After deciding the number of factors, each MoMVA item was evaluated using their factor loading. An item with factor loading >0.4 indicates that the item is needed in the MoMVA.[26] Moreover, if the factor structure needs rotation, oblimin rotation method was used.

When the factor structure of the MoMVA had been determined, Cronbach's α was used to examine the internal

consistency for this measure. Moreover, corrected item-to-total correlations were assessed to reevaluate if the items in the MoMVA are needed. Acceptable Cronbach's α is >0.7 and acceptable corrected item-to-total correlation is >0.4.[27] Following this, each factor of the MoMVA was tested for concurrent validity using risk perception of contracting Mpox in the next month and intention to receive an Mpox vaccination. Pearson correlations were used for the concurrent validity. It was hypothesized that the MoMVA score would be significantly associated with intention to receive an Mpox vaccination.

Lastly, the MoMVA scores were compared between the following groups: participants who had been vaccinated for Mpox vs. those who had not; participants who were gay vs. those who were bisexual; and participants who had an educational level at senior high or below vs. those who had an educational level at college or above. The comparisons were tested using independent *t*-tests. Cohen's d was computed to examine the effect size of the comparison, where $d < 0.2$ indicates small effect size; 0.2 to 0.5 small-to-medium effect size; 0.5 to 0.8 medium to large effect size; and >0.8 large effect size.[28] In the comparison tests, it was hypothesized that participants who had been vaccinated would have significantly different MoMVA scores from those who had not vaccinated. It was also hypothesized that all the other comparisons would not be significantly different. All the data analyses were performed using the SPSS 17.0 (SPSS Inc., Chicago, IL.).

Results

The present sample (N = 389) had a mean age of 33.72 years (SD = 6.42) with the majority being gay (n = 343; 88.2%).

Table 1. Participant characteristics (*N* = 389).

Varia	Mean (SD) or *n* (%)
Age (in years), mean (SD)	33.72 (6.42)
Sexual orientation, *n* (%)	
Gay	343 (88.2)
Bisexual	46 (11.8)
Educational level, *n* (%)	
≤senior high	35 (9.0)
≥college	354 (91.0)
Vaccination status, *n* (%)	
Not vaccinated	156 (40.1)
Vaccinated	233 (59.9)
Intention to receive an Mpox vaccine, mean (SD)	8.66 (2.12)

Table 2. Descriptive statistics of the items in the Motors of Mpox Vaccination Acceptance Scale (MoMVA).

Measure	Mean (SD)	n (%)							Skewness	Kurtosis
Item#		Score 1	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7		
MoMVA										
MoMVA1	6.10 (0.96)	3 (0.8)	1 (0.3)	3 (0.8)	12 (3.1)	52 (13.4)	174 (44.7)	144 (37.0)	−1.86	6.21
MoMVA2	5.93 (1.15)	4 (1.0)	2 (0.5)	11 (2.8)	18 (4.6)	72 (18.5)	141 (36.2)	141 (36.2)	−1.51	3.14
MoMVA3	5.96 (1.27)	6 (1.5)	2 (0.5)	8 (2.1)	35 (9.0)	56 (14.4)	109 (28.0)	173 (44.5)	−1.51	2.58
MoMVA4	6.28 (1.02)	4 (1.0)	0 (0.0)	5 (1.3)	10 (2.6)	42 (10.8)	124 (31.9)	204 (52.4)	−2.20	7.02
MoMVA5	5.69 (1.47)	8 (2.1)	13 (3.3)	13 (3.3)	34 (8.7)	69 (17.7)	104 (26.7)	148 (38.0)	−1.29	1.27
MoMVA6	6.11 (1.16)	8 (2.1)	2 (0.5)	1 (0.3)	16 (4.1)	49 (12.6)	139 (35.7)	174 (44.7)	−2.20	6.48
MoMVA7	3.96 (1.99)	70 (18.0)	37 (9.5)	41 (10.5)	85 (21.9)	57 (14.7)	46 (11.8)	53 (13.6)	−0.06	−1.13
MoMVA8	5.83 (1.26)	7 (1.8)	2 (0.5)	7 (1.8)	37 (9.5)	66 (17.0)	131 (33.7)	139 (35.7)	−1.45	2.66
MoMVA9	6.22 (1.10)	5 (1.3)	1 (0.3)	5 (1.3)	14 (3.6)	46 (11.8)	114 (29.3)	204 (52.4)	−2.11	5.94
MoMVA10	4.33 (1.83)	37 (9.5)	37 (9.5)	40 (10.3)	91 (23.4)	80 (20.6)	40 (1.03)	64 (16.5)	−0.21	−0.83
MoMVA11	4.13 (1.97)	65 (16.7)	29 (7.5)	34 (8.7)	88 (22.6)	66 (17.0)	51 (13.1)	56 (14.4)	−0.21	−1.04
MoMVA12	5.71 (1.50)	14 (3.6)	9 (2.3)	7 (1.8)	37 (9.5)	55 (14.1)	122 (31.4)	145 (37.3)	−1.51	2.01

Almost all participants had completed higher education (91.0% with an educational level of college or above) and more than half of the participants had been vaccinated against Mpox (n = 233; 59.9%). Table 1 additionally reports the participants' scores on perceived risk of contracting Mpox in the next month and their intention to receive an Mpox vaccination. Table 2 reports the descriptive statistics of the MoMVA items. In brief, skewness values were between −0.06 and −2.20 for the MoMVA; kurtosis values were between −1.13 and 7.02 for the MoMVA. The $p$values of the Kolmogorov–Smirnov test for the distributions of the 12 items on the MoMVA were greater than 0.05. However, they might be caused by the large sample size. According to Kim,[29] the absolute skewness values <2 and kurtosis values <7 indicate normal distribution if the sample size was larger than 300. Given that the absolute values of skewness values were <2 and kurtosis were <7 or nearly 7, the values of the 12 items on the MoMVA were considered normally distributed.

Both Kaiser–Meyer–Olkin (0.878 for MoMVA) and Barlett sphericity tests (p-value < .001) suggested that the MoMVA data were suitable for EFA. Table 3 shows the results of EFA. The EFA results showed that the MoMVA had a two-factor structure

(named as positive and negative motors) with acceptable factor loadings for all the items. Items of the positive motors and negative motors in the scale are provided in Appendix. Table 3 also shows that the two MoMVA factors and the entire MoMVA had acceptable internal consistency (Cronbach's α = 0.793 to 0.914) with adequate corrected item-to-total correlations. Both MoMVA factors were significantly associated with intention to receive an Mpox vaccination (r = 0.403 with positive motors and −0.163 with negative motors; p-values < 0.001).

The independent t-tests showed significant differences between the participants who had been vaccinated and those who had not in the MoMVA positive motors score (Cohen's d = 0.52; p < .001) and in MoMVA negative motors score (Cohen's d = 0.35; p = .001). No significant differences in the MoMVA scores were found between the groups with regards sexual orientation or educational level (Table 4).

Discussion

The present study adapted the MoVac-COVID19S to develop the MoMVA.[18] The MoMVA was then examined for its psychometric properties among a sample of MSM. The results

Table 3. Internal validity results of the Motors of Mpox Vaccination Acceptance Scale (MoMVA).

Measure Item#	Loading	CITT	Eigenvalue	Explained variance %	α
MoMVA[a]					0.809
MoMVA_F1			5.238	43.648	0.914
MoMVA1	0.707	0.676			
MoMVA2	0.807	0.772			
MoMVA3	0.830	0.784			
MoMVA4	0.835	0.794			
MoMVA5	0.715	0.669			
MoMVA6	0.832	0.790			
MoMVA8	0.836	0.798			
MoMVA9	0.721	0.692			
MoMVA12	0.493	0.468			
MoMVA_F2			1.762	14.684	0.793
MoMVA7	0.699	0.592			
MoMVA10	0.767	0.656			
MoMVA11	0.799	0.662			

Notes: Loadings were derived from exploratory factor analysis using the principal axis factoring extraction method.
CITT=corrected item-to-total correlation; α=Cronbach's α.
MoMVA_F1=positive motors; MoMVA_F2=negative motors.
A Kaiser-Meyer-Olkin value = 0.878; χ^2 of Barlett sphericity test = 2884.74, df = 66, p < .001.Using oblimin rotation method.

Table 4. Comparing the Motors of Mpox Vaccination Acceptance Scale (MoMVA) between groups with vaccination status, sexual orientation, and educational levels.

	Mean (SD)		t (p-value)	Cohen's d
	Not vaccinated (n = 156)	Vaccinated (n = 233)		
MoMVA_F1	51.26 (8.61)	55.56 (7.93)	5.07 (<0.001)	0.52
MoMVA_F2	13.38 (3.89)	11.76 (5.33)	3.48 (0.001)	0.35
	Gay (n = 343)	Bisexual (n = 46)		
MoMVA_F1	54.04 (8.39)	52.30 (8.92)	1.31 (0.19)	0.20
MoMVA_F2	12.32 (4.86)	13.09 (4.91)	1.01 (0.32)	0.16
	≤Senor high (n = 35)	≥College (n = 354)		
MoMVA_F1	55.26 (7.89)	53.69 (8.52)	1.04 (0.30)	0.19
MoMVA_F2	12.80 (5.80)	12.37 (4.77)	0.50 (0.62)	0.08

Notes: MoMVA_F1=positive motors; MoMVA_F2 = negative motors.
MoMVA_F1 is the summed score of nine items on a seven-point Likert scale; MoMVA_F2 is the summed score of three items on a seven-point Likert scale.

demonstrated that the MoMVA had a two-factor structure (positive and negative motors). Moreover, the MoMVA had acceptable internal consistency, concurrent validity, and known-group validity.

Unlike the previous studies showing a four-factor or a two-factor structure of the MoVac-COVID19S,[18–20] the present study's findings showed that the MoMVA had a two-factor structure. The two factors found in the MoMVA were subsequently named as "positive motors" and "negative motors" according to the item descriptions. More specifically, the nine positively worded items grouped together and the three negatively worded items grouped together according to the EFA findings. When scrutinizing the items embedded in the positive motors factor of the MoMVA, it was observed that these items described individuals' positive attitudes toward the values of an Mpox vaccination, sufficient knowledge of an Mpox vaccination, and autonomy to receive an Mpox vaccination. On the other hand, when scrutinizing the items embedded in the negative motors factor of the MoMVA, the items described individuals' reluctant attitude toward receiving an Mpox vaccination and insufficient knowledge of an Mpox vaccination. Therefore, it is tentatively concluded that MSM interpret their motors of Mpox vaccination acceptance with positive or negative attitudes.

Most previous studies have used a single question to evaluate participants' intention to receive an Mpox vaccination.[4–8,13] The results of the present study confirmed that MSM's intention to receive an Mpox vaccination comprises multiple components, including knowledge regarding vaccines, attitudes toward the value of receiving a vaccination, and confidence in deciding to receive a vaccination. The adequate psychometric propensities of the MoMVA support its value in assessing MSM's cognitive motivation to receive a vaccination against Mpox.

It should be noted that the items of the MoMVA comply with the CME requiring the cognitive components of the motivation to adopt the behaviors with positive change effects.[14] In other words, MoMVA should be associated with individuals' intention. Therefore, the present study demonstrated that the positive motors factor was positively and significantly associated with intention to receive an Mpox vaccination, whereas the negative motors factor was negatively and significantly associated with intention to receive an Mpox vaccination. Both MoMVA factors can differentiate MSM who had been vaccinated from those who had not. The results further indicate that the MoMVA is a valid instrument for assessing the cognitive component of motivation to receive an Mpox vaccination among MSM.

Strengths and limitations

The present study developed the first instrument assessing MSM's cognitive components of motivation to receive an Mpox vaccination. However, the present study has several limitations. First, *Facebook* and *Line* users are spread across all age groups in Taiwan. *Facebook* is used by 2.6 million Taiwanese individuals aged 50 to 59 years, and 2.5 million Taiwanese individuals aged 60 years or older.[24] However, the participants recruited through an online advertisement on the *Facebook* and *Professional Technology Temple* may not be representative of the population. For example, a review of a study that recruited respondents through *Facebook* reported a bias in favor of women, young adults, and individuals with higher education and higher incomes.[30] Sampling bias may have occurred and the sample was not necessarily representative of MSM. Future studies with more representative samples are needed. Second, all data were self-reported by the participants. Therefore, the researchers could not fully control for single-rater and recall biases. Further studies should also collect information from other sources. Third, the present study investigated a privacy issue related to the prevention and spreading of sexually transmitted diseases. Although an online anonymous survey was used and the confidentiality of the data was guaranteed, participants might still have given socially desirable responses instead of choosing responses that were reflective of their true feelings. The community's feelings about the stigma of MSM infection with Mpox need to be investigated and clarified. Fourth, although MSM is the group with a high risk of contracting Mpox, Mpox can infect populations other than MSM. The suitability of the MoMVA among populations and cohorts other than MSM warrant further study.

Conclusion

The present study demonstrated that the MoMVA is reliable and valid psychometric instrument for assessing MSM's cognitive components of motivation to receive an Mpox vaccination. Because Mpox is still spreading, healthcare providers could employ the MoMVA to obtain information about MSM's willingness to receive a vaccination against Mpox and to develop programs to increase the uptake of the vaccine.

Disclosure statement

Funding

Notes on contributors

Cheng-Fang Yen, M.D., Ph.D., is a professor of Psychiatry at Kaohsiung Medical University and is an attending doctor at Department of Psychiatry at Kaohsiung Medical University Hospital in Kaohsiung, Taiwan. His main research interests are substance use and mental health of children and adolescents.

Chien-Wen Lin, MD, is an attending doctor at Department of Psychiatry at Kaohsiung Medical University Hospital in Kaohsiung, Taiwan. Her main research interest is community mental health.

ORCID

Cheng-Fang Yen http://orcid.org/0000-0003-1156-4939

Author contributions

Data availability statement

The data are available upon reasonable request to the corresponding authors.

Informed consent statement

Online informed consent was obtained from all participants involved in the study.

References

1. World Health Organization. Mpox (monkeypox). 2023 [accessed 2023 Dec 29]. https://www.who.int/news-room/fact-sheets/detail/monkeypox.
2. World Health Organization. Mpox (monkeypox). 2023 [accessed 2023 Dec 29]. https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON493.
3. Bunge EM, Hoet B, Chen L, Lienert F, Weidenthaler H, Baer LR, Steffen R, Gromowski G. The changing epidemiology of human monkeypox—A potential threat? A systematic review. PLoS Negl Trop Dis. 2022;16(2):e0010141. doi:10.1371/journal.pntd.0010141.
4. Hori D, Kaneda Y, Ozaki A, Tabuchi T. Sexual orientation was associated with intention to be vaccinated with a smallpox vaccine against mpox: a cross-sectional preliminary survey in Japan. Vaccine. 2023;41(27):3954–3959. doi:10.1016/j.vaccine.2023.05.050 .
5. Saguil A, Krebs L, Choe U. Mpox: rapid evidence review. Am Fam Physician. 2023;108(1):78–83.
6. Maan I, Kohli M, Gilson R. Mpox in people living with HIV. Curr Opin Infect Dis. 2024;37(1):1–7. doi:10.1097/QCO.0000000000000994.
7. Centers for Disease Control, Taiwan. 2023 [accessed 2023 Dec 29]. https://nidss.cdc.gov.tw/nndss/disease?id=MPXV.
8. Paparini S, Whitacre R, Smuk M, Thornhill J, Mwendera C, Strachan S, Nutland W, Orkin C. Public understanding and awareness of and response to monkeypox virus outbreak: a cross-sectional survey of the most affected communities in the United Kingdom during the 2022 public health emergency. HIV Med. 2023;24(5):544–557. doi:10.1111/hiv.13430.
9. Torres TS, Silva MST, Coutinho C, Hoagland B, Jalil EM, Cardoso SW, Moreira J, Magalhaes MA, Luz PM, Veloso VG, et al. Evaluation of Mpox knowledge, stigma, and willingness to vaccinate for Mpox: cross-sectional web-based survey among sexual and gender minorities. JMIR Public Health Surveill. 2023;9: e46489. doi:10.2196/46489.
10. Caycho-Rodríguez T, Tomás JM, Vilca LW, Carbajal-León C, Gallegos M, Reyes-Bossio M, Oré-Kovacs N, Muñoz-Del-Carpio-Toia Á, Torales J, Barria-Asenjo NA, et al. Relationship between fear of monkeypox and intention to be vaccinated against monkeypox in a Peruvian sample. The mediating role of conspiracy beliefs about monkeypox. Eval Health Prof. 2023;46(4):353–361. doi:10.1177/01632787231180195.
11. Dong C, Yu Z, Zhao Y, Ma X. Knowledge and vaccination intention of monkeypox in China's general population: a cross-sectional online survey. Travel Med Infect Dis. 2023;52:102533. doi:10.1016/j.tmaid.2022.102533.
12. Dukers-Muijrers NHTM, Evers Y, Widdershoven V, Davidovich U, Adam PCG, Op de Coul ELM, Zantkuijl P, Matser A, Prins M, de Vries HJC, et al. Mpox vaccination willingness, determinants, and communication needs in gay, bisexual, and other men who have sex with men, in the context of limited vaccine availability in the Netherlands (Dutch mpox-survey). Front Public Health. 2023;10:1058807. doi:10.3389/fpubh.2022.1058807.
13. Smith LE, Potts HW, Brainard J, May T, Oliver I, Amlôt R, Yardley L, Rubin GJ. Did mpox knowledge, attitudes and beliefs affect intended behaviour in the general population and men who are gay, bisexual and who have sex with men? An online cross-sectional survey in the UK. BMJ Open. 2023;13(10): e070882. doi:10.1136/bmjopen-2022-070882.
14. Thomas KW, Velthouse BA. Cognitive elements of empowerment: an "interpretive" model of intrinsic task motivation. Acad Manag Rev. 1990;15(4):666–681. doi:10.2307/258687.
15. Alarifi AM, Alshahrani NZ, Sah R. Are Saudi healthcare workers willing to receive the monkeypox virus vaccine? Evidence from a descriptive-baseline survey. Trop Med Infect Dis. 2023;8(8):396. doi:10.3390/tropicalmed8080396.
16. Islam MR, Haque MA, Ahamed B, Tanbir M, Khan MR, Eqbal S, Rahman MA, Shahriar M, Bhuiyan MA, Napoli C. Assessment of vaccine perception and vaccination intention of mpox infection among the adult males in Bangladesh: a cross-sectional study findings. PLoS One. 2023;18(6):e0286322. doi:10.1371/journal.pone.0286322.
17. Winters M, Malik AA, Omer SB, Harapan H. Attitudes towards Monkeypox vaccination and predictors of vaccination intentions among the US general public. PLoS One. 2022;17(12):e0278622. doi:10.1371/journal.pone.0278622.
18. Chen IH, Ahorsu DK, Ko NY, Yen CF, Lin CY, Griffiths MD, Pakpour AH. Adapting the motors of influenza vaccination acceptance scale into the motors of COVID-19 vaccination acceptance scale: psychometric evaluation among mainland Chinese university students. Vaccine. 2021;39(32):4510–4515. doi:10.1016/j.vaccine.2021.06.044.
19. Fan CW, Chen JS, Addo FM, Adjaottor ES, Amankwaah GB, Yen CF, Ahorsu DK, Lin CY. Examining the validity of the drivers of COVID-19 vaccination acceptance scale using Rasch analysis. Expert Rev Vaccines. 2022;21(2):253–260. doi:10.1080/14760584.2022.2011227.
20. Yeh YC, Chen IH, Ahorsu DK, Ko NY, Chen KL, Li PC, Yen CF, Lin CY, Griffiths MD, Pakpour AH. Measurement invariance of the drivers of COVID-19 vaccination acceptance scale: comparison between Taiwanese and mainland Chinese-speaking populations. Vaccines. 2021;9(3):297. doi:10.3390/vaccines9030297.
21. Chen IH, Wu PL, Yen CF, Ullah I, Shoib S, Zahid SU, Bashir A, Iqbal N, Addo FM, Adjaottor ES, et al. Motors of COVID-19 vaccination acceptance scale (MoVac-COVID19S): evidence of measurement invariance across five countries. Risk Manag Healthc Policy. 2022;15:435–445. doi:10.2147/RMHP.S351794.
22. Pramukti I, Strong C, Chen IH, Yen CF, Rifai A, Ibrahim K, Pandin MGR, Subramaniam H, Griffiths MD, Lin CY, et al. The motors of COVID-19 vaccination acceptance scale (MoVac-COVID19S): measurement invariant evidence for its nine-item version in Taiwan, Indonesia, and Malaysia. Psychol Res Behav Manag. 2022;15:1617–1625. doi:10.2147/PRBM.S363757.
23. Huang MF, Chang YP, Lin CW, Yen CF. Factors related to mpox-vaccine uptake among men who have sex with men in Taiwan: roles of information sources and emotional problems. Vaccines. 2024;12(3):332. doi:10.3390/vaccines12030332.

24. Digital 2024: Taiwan. [accessed 2024 Oct 2]. https://datareportal.com/reports/digital-2024-taiwan.
25. PTT Bulletin Board System. [accessed 2024 Oct 2]. https://en.wikipedia.org/wiki/PTT_Bulletin_Board_System.
26. Costello AB, Osborne J. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. Pract Assess Res Eval. 2005;10(7):1–9.
27. Comrey AL, Lee HB. A first course in factor analysis. Hillsdale (NJ): Erlbaum; 1992.
28. Kaiser HF, Rice J. Little Jiffy Mark Iv. Educ Psychol Meas. 1974;34 (1):111–117. doi:10.1177/001316447403400115.
29. Kim HY. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restor Dent Endod. 2013 Feb. 38(1):52–54. doi:10.5395/rde.2013.38.1.52.
30. Whitaker C, Stevelink S, Fear N. The use of Facebook in recruiting participants for health research purposes: a systematic review. J Med Internet Res. 2017;19(8):e290. doi:10.2196/jmir.7071.

Appendix

Motors of Mpox Vaccination Acceptance Scale: English version (items of positive motors: 1-6, 8, 9, 12; items of negative motors: 7, 10, 11)

(1) Vaccination is a very effective way to protect me against Mpox.
(2) I know very well how vaccination protects me from Mpox.
(3) It is important that I get the Mpox jab.
(4) Vaccination greatly reduces my risk of catching Mpox.
(5) I understand how the Mpox jab helps my body fight Mpox virus.
(6) The Mpox jab plays an important role in protecting my life and that of others.
(7) I feel under pressure to get the Mpox jab.
(8) The contribution of the Mpox jab to my health and well-being is very important.
(9) I can choose whether to get an Mpox jab or not.
(10) How the Mpox jab works to protect my health is a mystery to me.
(11) I get the Mpox jab only because I am required to do so.
(12) Getting the Mpox jab has a positive influence on my health.

Rating for each item:
  Strongly disagree (1)
  Disagree (2)
  Slightly disagree (3)
  Neither disagree nor agree (4)
  Slightly agree (5)
  Agree (6)
  Strongly agree (7)
  Factor structures and containing items:

Motors of Mpox Vaccination Acceptance Scale: Chinese version

(1) 「注射疫苗將能非常有效地保護我免於感染猴痘。」
(2) 「我非常清楚疫苗將會如何保護我免於感染猴痘。」
(3) 「對我來說, 注射猴痘疫苗將會是重要的事。」
(4) 「注射疫苗將能大幅降低我感染猴痘的機會。」
(5) 「我了解疫苗將經由何種機制來幫助我的身體對抗猴痘病毒。」
(6) 「猴痘疫苗將會在保護我和其他人的生命上扮演重要角色。」
(7) 「我預測未來我將會在注射猴痘疫苗這件事情上感受到壓力。」
(8) 「猴痘疫苗將會對於我的健康和幸福有著重要貢獻。」
(9) 「未來我將會幫自己決定是否要注射猴痘疫苗。」
(10) 「猴痘疫苗將會如何保護我的健康, 對我來說還是謎。」
(11) 「未來我將只有在被要求要注射時才會去注射猴痘疫苗。」
(12) 「注射猴痘疫苗將會對我的健康有正面的影響。」

每一題評分:
  完全不同意 (1)
  很不同意 (2)
  有一點不同意 (3)
  沒同意也沒不同意 (4)
  有一點同意 (5)
  很同意 (6)
  完全同意 (7)