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OBJECTIVE

➤ To compare the psychometric properties between **EQ-5D-Y-3L (Y-3L)** and **EQ-5D-Y-5L (Y-5L)** in Chinese adolescents.

METHODS

- A sample of adolescents aged 10-18 years were recruited from 11 schools across various geographical regions in China.
- Respondents were asked to complete an online questionnaire including Y-3L, Y-5L, CHU-9D, and socio-demographics. A subsample retested after two weeks.
- The **ceiling/floor effects** were assessed by examining the percentage in the best/worst health states. The **discriminative power** was evaluated using the Shannon index (H') and evenness index (J'). The **test-retest reliability** was assessed by examining Gwet's agreement coefficient (AC) for responses over a two-week period. The **convergent validity** was examined using Spearman's rank correlation with CHU-9D. The **known-groups validity** was determined by using F-statistics, Scheffe post hoc tests and effect sizes (ES). The **response consistency** of two instruments was evaluated. Inconsistency was described as a Y-3L response that is at least two levels away from the equivalent Y-5L response.

RESULTS

- **Socio-demographic characteristics of respondents**
- A total of **4,873** adolescents (**50.01% male, age 15.3 ± 1.4 years**) were included.
- Junior and senior high school students comprised **52.6%** and **47.4%** of the respondents, respectively.
- **Ceiling/floor effects**
- The overall ceiling effects of Y-3L and Y-5L were **64.8%** and **58.3%**, respectively. Floor effect was not found.

Table 1 Discriminative power and test-retest reliability of EQ-5D-Y-3L and EQ-5D-Y-5L

Dimension	EQ-5D-Y-3L				EQ-5D-Y-5L			
	H'	J'	Agreement		H'	J'	Agreement	
			Gwet's AC	(%)			Gwet's AC	(%)
Mobility	0.14	0.09	0.967	96.79%	0.18	0.08	0.974	97.44%
Looking after myself	0.08	0.05	0.994	99.36%	0.09	0.04	0.981	98.08%
Doing usual activities	0.40	0.25	0.937	94.23%	0.53	0.23	0.900	90.38%
Pain/Discomfort	0.74	0.47	0.735	77.56%	0.95	0.41	0.737	77.56%
Worried/Sad/Unhappy	0.96	0.61	0.693	75.00%	1.38	0.59	0.627	67.31%

Table 2 Convergent validity: Spearman's correlation coefficient

Dimension of measure	CHU-9D									
	Worried	Sad	Pain	Tired	Annoyed	Schoolwork/homework	Sleep	Daily routine	Activities	
Mobility	0.0797***	0.0832***	0.1446***	0.0844***	0.0897***	0.0900***	0.1148***	0.1529***	0.1326***	
Selfcare	0.0301*	0.0292*	0.0610***	0.0398	0.0383**	0.047**	0.0580***	0.0693***	0.0612***	
Y-3L Doing usual activities	0.2086***	0.2067***	0.2054***	0.2010***	0.2182***	0.2010***	0.2043***	0.2332***	0.2645***	
Pain/Discomfort	0.3659***	0.3519***	0.5505***	0.3898***	0.3564***	0.2656***	0.3728***	0.2565***	0.2992***	
Worried/Sad/Unhappy	0.5459***	0.5377***	0.4086***	0.4879***	0.4739***	0.3563***	0.4223***	0.2525***	0.3317***	
Mobility	0.1172***	0.1070***	0.1660***	0.1170***	0.1295***	0.1002***	0.1299***	0.1970***	0.1461***	
Selfcare	0.0496***	0.0654***	0.0618***	0.0780***	0.0726***	0.0739***	0.0891***	0.1266***	0.0900***	
Y-5L Doing usual activities	0.2378***	0.2404***	0.2410***	0.2300***	0.2520***	0.2213***	0.2341***	0.2566***	0.2799***	
Pain/Discomfort	0.3879***	0.3643***	0.6132***	0.4017***	0.3706***	0.2703***	0.3965***	0.2705***	0.2935***	
Worried/Sad/Unhappy	0.5973***	0.5760***	0.4047***	0.5347***	0.4927***	0.4012***	0.4298***	0.2537***	0.3341***	

Notes: *** indicates p < 0.001, ** indicates p < 0.01, * indicates p < 0.05
r > 0.4 represents a moderate to strong correlation. The green highlighted cells indicate dimension pairs that are conceptually related.

Table 3 Discriminative validity of the EQ-5D-Y-3L and EQ-5D-Y-5L level sum scores across known groups

Characteristics	EQ-5D-Y-3L level sum score				EQ-5D-Y-5L level sum score			
	Mean (SD)	p value	Scheffe post hoc test	Effect size (95% CI)	Mean (SD)	p value	Scheffe post hoc test	Effect size (95% CI)
Obesity		0.309		0.067 (-0.071, 0.205)		0.286		0.067 (-0.071, 0.205)
I: Normal weight (n=4052)	5.61 (0.99)		No significant difference		5.96 (1.55)		No significant difference	
II: Overweight (n=608)	5.56 (0.97)				5.87 (1.76_			
III: Obesity (n=213)	5.54 (1.05)				5.86 (1.93)			
Sleep		<0.001		-1.773 (-2.097, -1.447)		<0.001		-2.017 (-2.345, -1.688)
I: 9 hours or more (n=674)	5.30 (0.69)		I<II***,		5.42 (0.96)		I<II***,	
II: 7-9 hours (n=2964)	5.49 (0.86)		I<III***,		5.76 (1.28)		I<III***,	
III: 5-7 hours (n=1193)	6.00 (1.20)		I<IV***,		6.63 (2.03)		I<IV***,	
IV: less than 5 hours (n=42)	6.81 (2.21)		II<III***,		8.40 (4.79)		II<III***,	
			II<IV***,				II<IV***,	
			III<IV***				III<IV***	
Sports		<0.001		-0.390 (-0.485, -0.295)		<0.001		-0.385 (-0.480, -0.290)
I: 5 hours or more (n=745)	5.38 (0.77)		I<III***,		5.59 (1.33)		I<III***,	
II: 3-4 hours (n=642)	5.53 (0.95)		I<IV***,		5.83 (1.43)		I<IV***,	
III: 2-3 hours (n=976)	5.60 (0.95)		I<V***,		5.97 (1.56)		I<V***,	
IV: 1-2 hours (n=1468)	5.62 (1.00)		II<V***,		5.95 (1.55)		II<V***,	
V: less than 1 hour (n=1042)	5.77 (1.13)		III<V**,		6.24 (1.89)		III<V**,	
			IV<V**				IV<V***	
Degree of family harmony		<0.001		-1.814 (-1.993, -1.635)		<0.001		-1.740 (-1.918, -1.561)
I: Very good (n=2819)	5.33 (0.73)		I<II***,		5.54 (1.21)		I<II***,	
II: Moderate (n=1919)	5.92 (1.12)		II<III***,		6.41 (1.77)		II<III***,	
III: Poor (n=135)	6.74 (1.43)		I<III***		7.82 (2.63)		I<III***	
Drink		<0.001		-1.731 (-2.134, -1.328)		<0.001		-1.698 (-2.101, -1.295)
I: Never drink (n=3932)	5.49 (0.88)		I<II***,		5.76 (1.43)		I<II***,	
II: Drink once or twice in lifetime (n=519)	5.89 (1.09)		I<III***,		6.35 (1.57)		I<III***,	
III: Drink at least once annually (n=311)	6.20 (1.22)		I<IV***,		7.00 (2.03)		I<IV***,	
IV: Drink at least once monthly (n=87)	6.43 (1.53)		I<V***,		7.43 (2.53)		I<V***,	
V: Drink at least once weekly (n=24)	7.04 (2.39)		II<III***,		8.25 (4.32)		II<III***,	
			II<IV***,				II<IV***,	
			II<V***,				II<V***,	
			III<V**				III<V**	
Smoke		<0.001		-1.658 (-2.122, -1.193)		<0.001		-1.495 (-1.959, -1.031)
I: Never smoke (n=4653)	5.57 (0.95)		I<II**,		5.90 (1.53)		I<II***,	
II: Experimented with 1-2 cigarettes in lifetime (n=121)	5.97 (1.24)		I<III***,		6.72 (2.05)		I<III***,	
III: Occasionally smoke (n=46)	6.37 (1.37)		I<V***,		7.39 (2.29)		I<V***,	
IV: Smoke several cigarettes in past week (n=7)	6.29 (1.38)		I<VI**,		6.71 (1.80)		I<V***,	
			II<V***				II<V**	
V: Smoke more than 1 pack of cigarettes in past week (n=18)	7.17 (2.68)				8.22 (4.80)			
VI: Used to smoke but have quit (n=28)	6.36 (1.50)				6.82 (1.98)			

Notes: *** indicates p < 0.001, ** indicates p < 0.01, * indicates p < 0.05.
One-way analyses of variance and Scheffe post hoc tests were performed to compare the EQ-5D-Y-3L and EQ-5D-Y-5L level sum score (LSS) among different sub-groups The effect size was calculated as the difference between the mean scores of two sub-groups divided by the pooled standard deviation. An effect size of 0.8 is defined as large, 0.5 to 0.79 as moderate, and 0.2 to 0.49 as small.

➤ Discriminative power

- As shown in Table 1, the discriminatory performance **varied by dimension**, with "Worried/Sad/Unhappy" showing the highest discriminatory power (Y-3L: H' =0.96, J' =0.61; Y-5L: H' =1.38, J' =0.59).
- **Y-5L** demonstrated **superior discriminative power**, as evidenced by its higher Shannon's H' indices across all dimensions.

➤ Test-retest reliability

- Test-retest reliability was **excellent (AC>0.8) for most dimensions**, but lower for "Pain/Discomfort" and "Worried/Sad/Unhappy".

➤ Convergent validity

- As shown in Table 2, convergent validity with the correlative dimension in CHU-9D was acceptable (Spearman's correlation **Y-3L: 0.2332-0.5505; Y-5L: 0.2566-0.6132**).

➤ Known-group validity

- As reported in Table 3, Both instruments **effectively differentiated groups based on sleep, sports, family harmony, smoking, and alcohol habits** (all P<0.001; ES Y-3L: 0.390-1.814, Y-5L: 0.385-2.017).
- However, neither of the two instruments was able to distinguish the different groups of obesity.

➤ Response consistency

- Response consistency was **highest for "Self-care"** (99.20%) and **lowest for "Worried/Sad/Unhappy"** (95.07%).

CONCLUSION

- Both Y-3L and Y-5L demonstrated acceptable psychometric properties in Chinese adolescents.
- These findings support the Y-5L as a robust instrument for health utility assessment in Chinese adolescents.