Net Promoter Score Model for Evaluating Paediatric Medicine Acceptability: Validation and Feasibility Study

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Introduction

- Evaluation of medication acceptability for paediatric patients should accurately reflect willingness of children to take the medication.
- Traditional taste evaluation methods are inadequate for capturing the complexity of factors influencing medication acceptability. Reliance on median or mean of taste scores with non-standardized cutoffs complicates inter-study comparisons, and these scores do not reliably translate into actual medication acceptance.
- As alternative, we proposed adopting the Net Promoter Score (NPS), which categorizes responses into promoters, passives, and detractors (Figure 1). NPS approach streamlines assessment to provide a score that may better encapsulate overall acceptance of test medication.

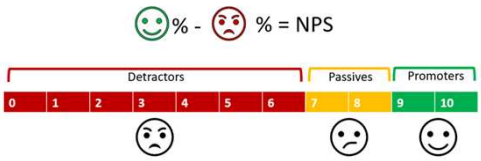

Figure 1. Calculation of Net Promoter Score (NPS). NPS ranges from -100 to +100, calculated by subtracting the percentage of detractors (scores 0-6) from the percentage of promoters (scores 9-10).

Aim

To validate the application of NPS in assessing the Medicine Acceptability Score (MAS) using existing data.

Methods

Study design

- Taste scores from four previous studies involving paediatric and young adult participants were analysed.
  - Study 1 and 2: Responses of children (3-16 years) to taste-masked chewable tablets of midazolam (MDZ TMT) and tramadol (TRM TMT) along with their respective oral liquid drug formulations (MDZ LQD and TRM LQD) using 5-point hedonic scale [1,2].
  - Study 3: Responses of young adults (18-25 years) to two taste-masked chewable tablets of flucloxacillin (FLX TMT 1 and FLX TMT 2) against commercial oral liquid (FLX LQD) using a 5-point hedonic scale [3].
  - Study 4: Responses of young adults (18-25 years) to taste-masked chewable tablets of prednisolone sodium phosphate (PSP TMT) against commercial oral liquid (PSP LQD) using an 11-point scale [4].
- All participants were also asked for willingness to take test medication again, and the response rate for each formulation was recorded.

Calculation of New Parameters

- Medicine Acceptability Score (MAS) was calculated from taste scores, using approach of NPS and different passive score ranges (Figure 2).
- Willingness to Take Medicine (WTM) was calculated by determining the deviation from 50% in the response rate for each formulation in the willingness to take the test medication again question. If the response rate exceeded 50%, the deviation was recorded as a positive value, while a response rate below 50% resulted in a negative deviation (Figure 3).

Optimisation of passive score range

- Optimal passive range identified based on correlation between WTM and MAS scores

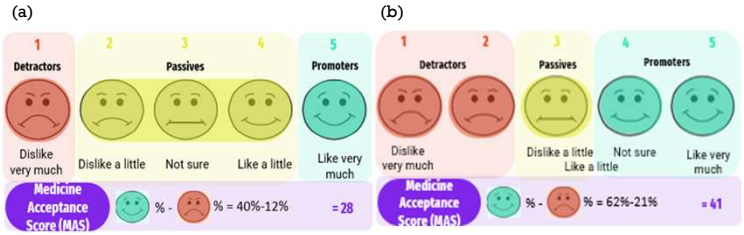

Figure 2. Example of MAS calculation using taste scores provided by 68 paediatric participants using a 5-point hedonic taste score for the tramadol taste-masked chewable tablet. MAS score calculated using passive score range of 2-4 (a) and passive score of 3 (b).

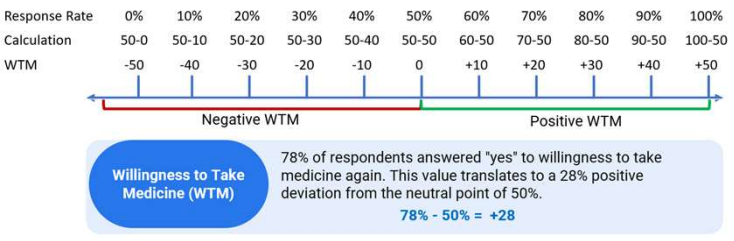

Figure 3. Example of WTM determining the deviation from 50% response rate for willingness to take test medication again provided by 68 paediatric participants for the tramadol taste-masked chewable tablet.

Results

Raw taste scores from studies 1 – 3, which used 5-point scales, are provided in Figure 4.

- TMT formulations generally had higher median scores, but translation to actual acceptability compared to the comparator remains uncertain.

Medicine Acceptability Scores (MAS) and Willingness to Take Medicine (WTM)

- Table 1 shows MAS calculated from taste scores using different passive score ranges.
- Table 1 also shows WTM calculated from willingness to take medications again.
- Across all passive score ranges used, when WTM was negative, MAS was also negative, indicating that good correlations for formulations categorized as unacceptable.
- Based on correlation between MAS and WTM, the optimal passive score range was 2-4.

Validation

- Applying the 2-4 passive score range to Study 4 (Figure 5), the calculated MAS indicated that PSP LQD was slightly unacceptable (MAS = -4) and PSP TMT was slightly acceptable (MAS = 12).
- Results confirmed strong correlation between MAS and WTM using this passive score range (Table 2).

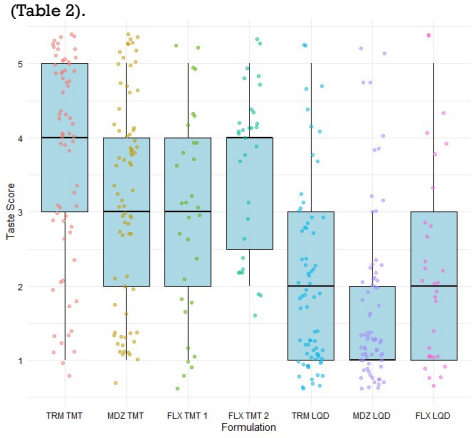

Figure 4. Box plots showing raw taste scores for Study 1-3, with boxes representing interquartile range and median, and whiskers indicating 10th and 90th percentiles and individual data points shown as solitary circles. Flucloxacillin = FLX; Midazolam = MDZ; Tramadol = TRM; Taste-Masked Chewable Tablet = TMT; LQD = Oral Liquid Formulation.

Table 1. Medicine Acceptability Scores (MAS) and Willingness to Take Again (WTM) for Studies 1 – 3. Flucloxacillin = FLX; Midazolam = MDZ; Tramadol=TRM; Taste-Masked Chewable Tablet = TMT; LQD = Oral Liquid Formulation

Formulation		FLX TMT 1	MDZ TMT	FLX TMT 2	TRM TMT	MDZ LQD	FLX LQD	TRM LQD
Passive score range used to calculate MAS	2-3	10	29	19	50	-51	-7	-34
	2-4	0	0	4	28	-56	-10	-41
	3	6	21	12	41	-76	-18	-59
	3-4	-4	-9	-3	19	-81	-21	-66
WTM		10	11	19	28	-13	-28	-16

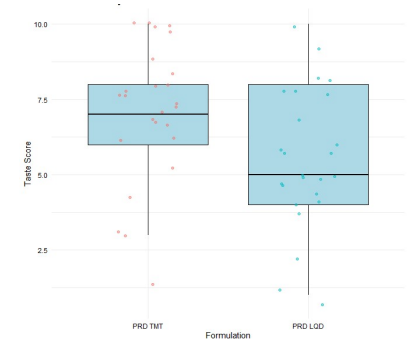

Table 2. Medicine Acceptability Scores (MAS) and Willingness to Take Medicine (WTM) for Study 4, which used 11-point score scale. Taste-Masked Chewable Tablet = TMT; Prednisolone Sodium Phosphate= PSP; Oral Liquid Formulation= LQD

Formulation	PSP TMT	PSP LQD
MAS	12	-4
WTM	6	-6

Figure 5. Box plots showing raw taste scores for Study 4, with boxes representing interquartile range and median, and whiskers indicating 10th and 90th percentiles, and individual data points shown as solitary circles. Prednisolone Sodium Phosphate = PSP; Taste-Masked Chewable Tablet = TMT; LQD = Oral Liquid Formulation.

Conclusion

- MAS offers a simplified and effective method for assessing medicinal formulation acceptability.
- It effectively distinguishes between acceptable and unacceptable products.

References

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