

Validation of a digital algorithm for clinical staging to support demand management and triage in youth mental health services: Proof of concept study

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Introduction

Youth mental health is too often a cause of disability and early loss of life¹. As the demand for mental health care continues to rise, managing waiting times and reducing treatment delays are key challenges to delivering timely and quality care.

Clinical staging is a heuristic model for youth mental health that can **guide care allocation** based on risk of **illness progression**^{2,3}. The application of staging has been limited to clinicians, yet digital technologies could be leveraged to apply clinical staging and increase the scalability and utility of the model in services

AIM: To validate a novel automated clinical stage algorithm and identify differences in demographic and clinical characteristics between the clinical stage groups

Methods

- 131 young people (age range: 16 – 25 years), who presented to youth mental health services for the first time between November 2018 to March 2021.
- Young people completed an online self-report questionnaire before their initial consultation with a clinician.
- The questionnaire collected their demographics, mental health concerns (psychological distress, depression, mania-like experiences etc.), social and occupation functioning, suicidal thoughts and behaviours, alcohol and substance use and physical health.
- Clinical stages (stage 1a or stage 1b+) were assigned by a digital algorithm based on online self-report measures and compared to independent expert ratings (i.e. psychiatrists).

A digital algorithm, that automates clinical stage assessment, can be used for **demand management in youth mental health services.**

Up to one-fifth of young people presenting for care could be directed to low intensity, self-directed interventions. This can improve access and **reduce treatment delays** for individuals with **higher risk of illness progression.**

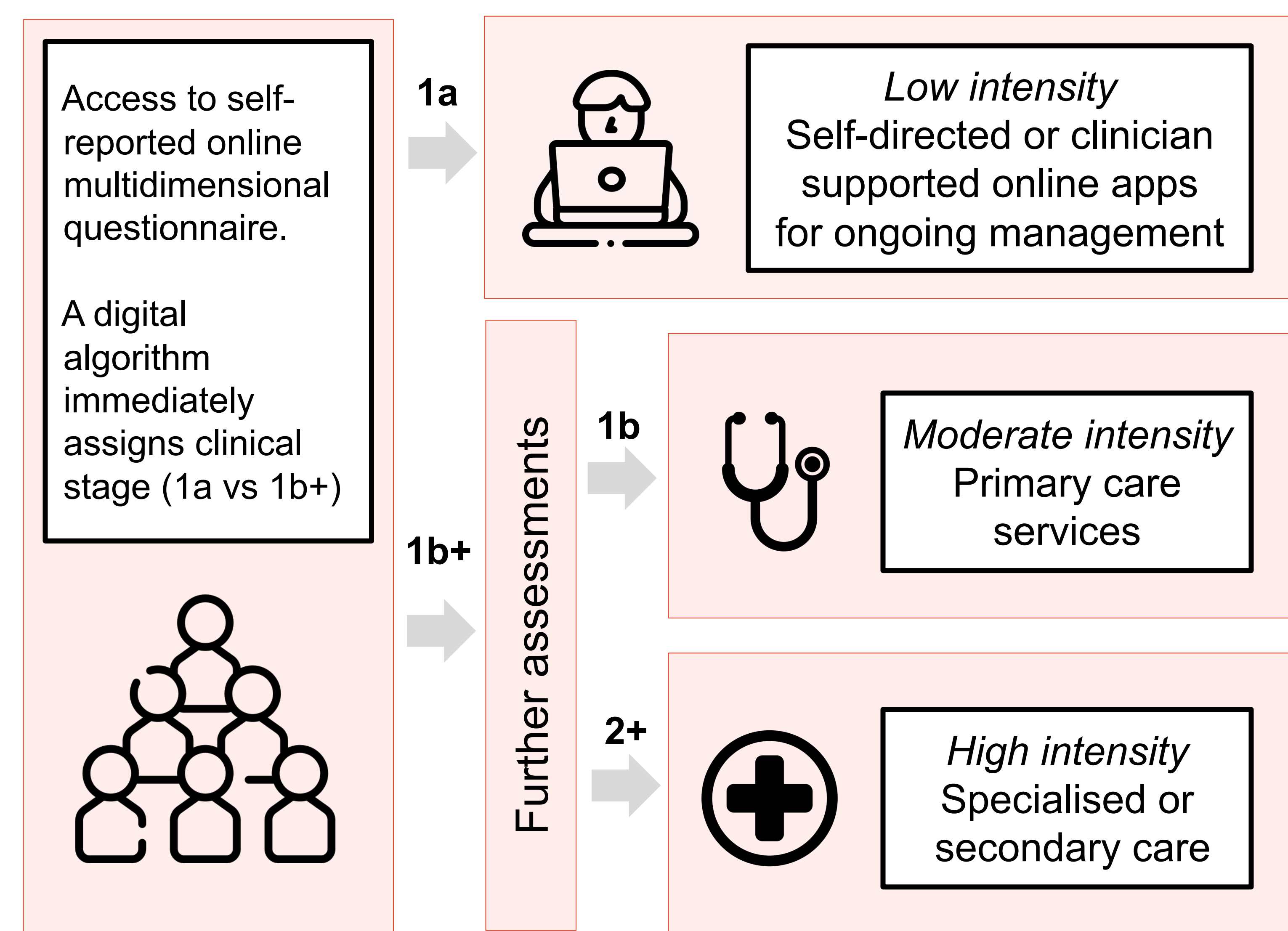
Results

- Of the 131 participants, the mean (SD) age was 20.3 (2.4) years and 94 (71.8%) of them were female.
- **91% of clinical stage ratings were concordant** between expert psychiatrist and the digital algorithm with substantial interrater agreement (kappa = 0.67, $P < 0.001$).
- The digital algorithm had 91% accuracy (CI: 85 – 95, $P = 0.03$), 66.7% sensitivity, 96.2% specificity and F1-score of 73%.
- Among the discordant cases, the algorithm tended to assign stage 1a to those with lower depressive mood scores ($P < 0.001$) and anxiety symptom scores ($P < 0.001$).

digital algorithm	Expert psychiatrist	
	Stage 1a (n = 20), n(%)	Stage 1b+ (n = 111), n(%)
Stage 1a (n = 24)	16 (12)	8 (6)
Stage 1b+ (n = 107)	4 (3)	103 (79)

Discussion

- Validates a digital algorithm to differentiate between individuals in the very early stages of illness (stage 1a) from those with increased risk of more severe syndromes (stage 1b+)
- Previous work estimates that 30% of presentations to services are stage 1a⁴. Applying this algorithm would **accurately assign 27% of the total presentations to stage 1a.**
- Directing these young people to low intensity interventions may reduce unnecessary delays for access and treatment and facilitate early intervention for those with increased risk of illness progression.



Conclusion

- Validation of this novel clinical staging algorithm presents a digital health solution for managing demand in current youth mental health services by allocating of care according to risk of illness progression.
- Further development of algorithm to accurately distinguish clients in stage 1b and stage 2 is required to facilitate further care allocation in youth mental health services

References

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