Use of Artificial Intelligence to Enhance Mental Health Screening in Chronic Atopic Dermatitis in Children and Adolescents

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Introduction

- Atopic dermatitis (AD) can cause psychological complications such as anxiety and depression
- Early detection of mental health concerns is challenging but can potentially improve quality of life

Clinical unmet need

Subtle signs overlooked in a busy clinic

Child/ caregivers do not volunteer information

Child unwilling or unable to express emotions accurately

Child does not understand the questionnaires, due to language barrier or young age

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Objective

- Evaluate the **usability and validity** of **2 artificial intelligence (AI) tools** to **enhance mental health screening** for paediatric patients with chronic AD
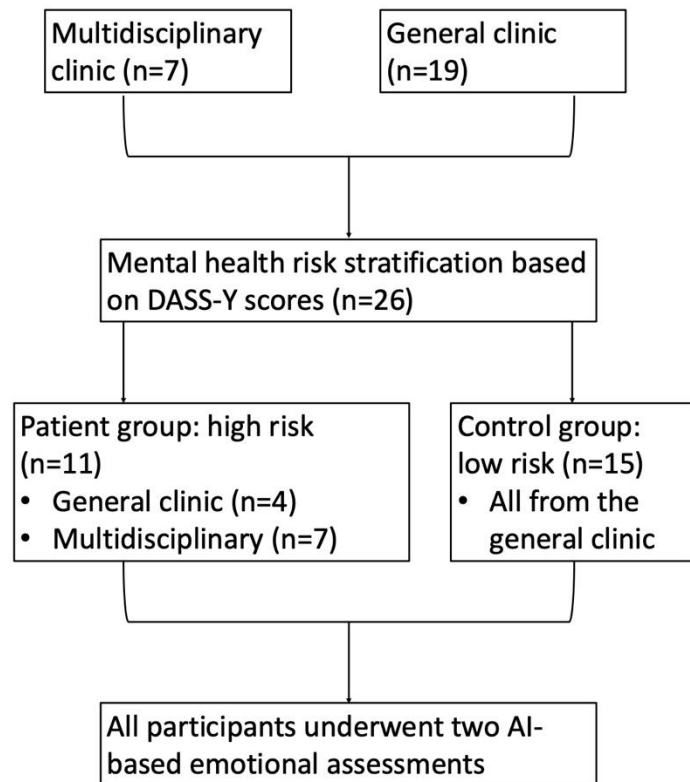- Pilot study in collaboration with Opsis Emotion AI

Methods

- Twenty-six patients with AD between 8-18 years old underwent AI-based emotional assessments
- Recruited from 2 clinics
  - Multidisciplinary dermatology-psychology clinic
  - General dermatology clinic
- Assigned to "patient" and "control" groups based on Depression Anxiety Stress Scale-Youth (DASS-Y) scores
- AI technicians interpreting the results were blinded to the group allocation


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┌─────────────────────┐    ┌─────────────────────┐
│ Multidisciplinary   │    │ General clinic      │
│ clinic (n=7)        │    │ (n=19)              │
└─────────────────────┘    └─────────────────────┘
              │                        │
              └───────────┬────────────┘
                          │
          ┌───────────────────────────────────┐
          │ Mental health risk stratification based │
          │ on DASS-Y scores (n=26)           │
          └───────────────────────────────────┘
              │                        │
┌─────────────────────────┐  ┌─────────────────────┐
│ Patient group: high risk│  │ Control group:      │
│ (n=11)                  │  │ low risk (n=15)     │
│ • General clinic (n=4)  │  │ • All from the      │
│ • Multidisciplinary (n=7)│ │   general clinic    │
└─────────────────────────┘  └─────────────────────┘
              │                        │
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          ┌───────────────────────────────────┐
          │ All participants underwent two AI-│
          │ based emotional assessments       │
          └───────────────────────────────────┘
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Methods – AI tools

- **SenseCare:** clinician-administered real-time webcam emotion analysis during consultations
- **SenseWell:** post-consultation self-administered platform
  - Incorporating facial emotion analysis with response to 2 standardized emotional well-being questions

  (1) "How have you been doing for the past few weeks?"

  (2) "How have you felt for the past few weeks?"

Real Time Analysis - Input

Emotion
- Valence
- Arousal
- Intensity of emotion

Ocular and head movement
- Eye openness/ blink
- Head-pose

Physiology
- Heart rate
- Blood pressure
- Electrodermal activity
- Respiratory rate

SenseWell

Risk of mental disorder – depression or anxiety

Normal   At risk

Opsis Emotion AI

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Results

- All consultations lasted for at least 5 minutes
- Range of emotion analysis durations
  - SenseWell: 16.2-91.4 seconds
  - SenseCare: 1.1-345.6 seconds
- Both tools were well received
- SenseWell demonstrated superior usability and adaptability for asynchronous use

Thousands of emotions
Capture subtle and complex expressions
Multi-modal emotion AI
Applicable for children
Multiple sources of input

Results

SenseWell detected significant differences in mean emotional valence (positive/negative emotions) between patient and control groups when emotion data exceeded 30 seconds in duration (p=0.008)

		Patient	Control	P-value
100+ frames	Mean Valence	-0.046 (n=11)	0.083 (n=15)	0.104
	Mean Arousal	0.081 (n=11)	0.116 (n=15)	0.382
300+ frames	Mean Valence	-0.100 (n=7)	0.086 (n=8)	**0.008**
	Mean Arousal	0.072 (n=7)	0.123 (n=8)	0.426

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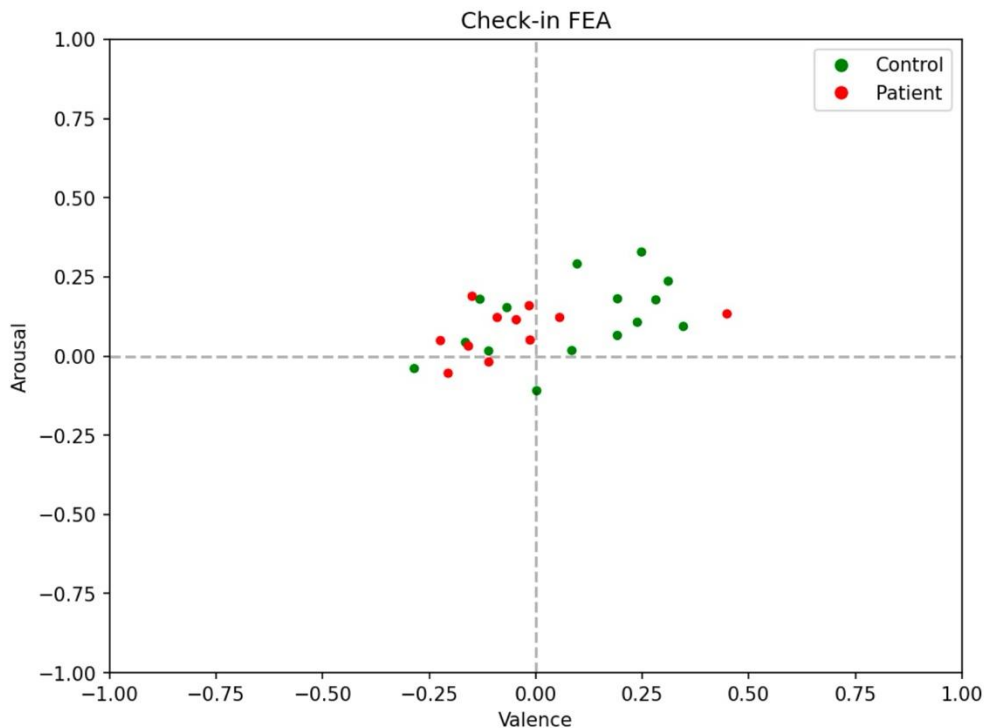
Results

- Scatterplot for SenseWell showing clear data separation
  - Control group is more concentrated in the positive valence region
  - Patient group clusters in the negative valence region

Results

Clinical FEA
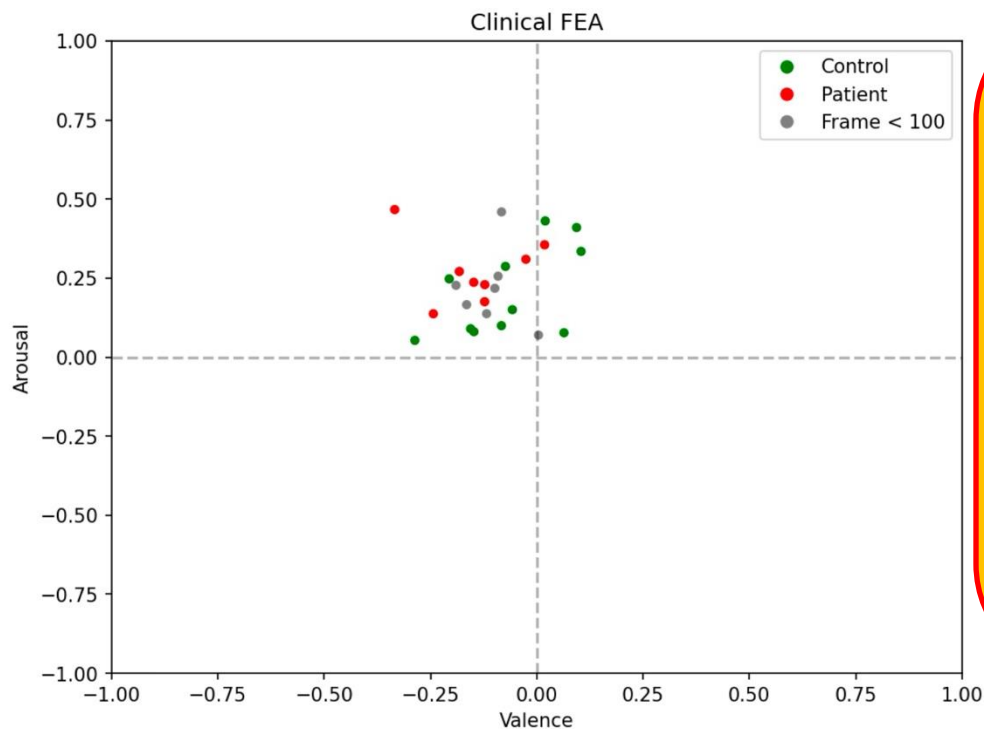
- Scatterplot for SenseCare shows less distinction between the two groups compared to SenseWell

Results

- SenseCare: observable differences in mean valence between the 2 groups, although not statistically significant
  - Larger data sets may uncover meaningful patterns in emotional differences between the groups

		Patient	Control	P-value
100+ frames	Mean Valence	-0.145 (n=8)	-0.066 (n=11)	0.174
	Mean Arousal	0.273 (n=8)	0.206 (n=11)	0.252
300+ frames	Mean Valence	-0.145 (n=8)	-0.056 (n=9)	0.122
	Mean Arousal	0.273 (n=8)	0.237 (n=9)	0.552

Conclusion

- AI-based emotion analysis can augment mental health screening in AD
- SenseCare offers value in capturing real-time emotional insights, but it is better suited for controlled environments
- SenseWell demonstrated advantages in terms of flexibility and scalability
  - Highly adaptable for fast-paced clinical setting
  - Cost effective and easy to use

First-of-its-kind mental health screening tool for children

Objective, effective and efficient

Early screening → Early intervention

Reduce clinical burden and healthcare costs

Scalable tool for broad community-based screening

Thank you!