FamilyScope: Visualizing Affective Aspects of Family Social Interactions using Passive Sensor Data

Hyunsoo Lee, Yugyeong Jung, Youwon Shin,
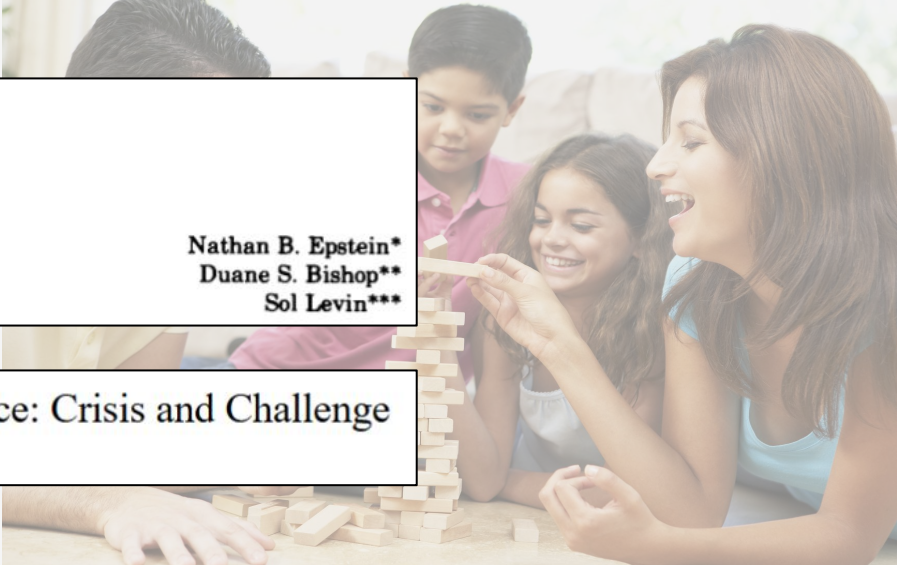Hyesoo Park, Woohyeok Choi, Uichin Lee

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Family as a social unit

What defines socially-emotionally healthy family?

The McMaster Model of Family Functioning

Nathan B. Epstein*
Duane S. Bishop**
Sol Levin***

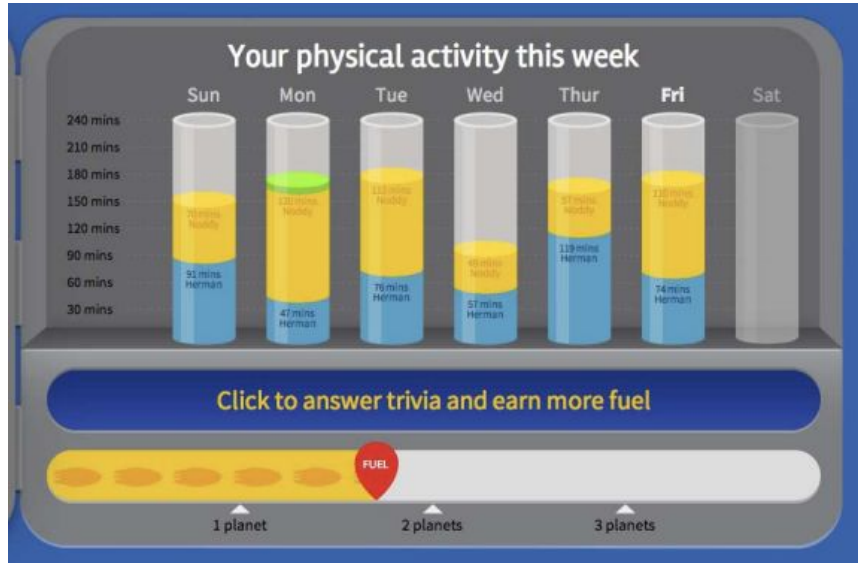The Concept of Family Resilience: Crisis and Challenge

FROMA WALSH, Ph.D.[a]

Family informatics

From Personal Informatics to Family Informatics: Understanding Family Practices around Health Monitoring

Laura R. Pina[1,2], Sang-Wha Sien[2], Teresa Ward[3], Jason C. Yip[4],
Sean A. Munson[2], James Fogarty[1], Julie A. Kientz[2]

Understanding family health practices in CSCW

Spaceship Launch (2015) - Physical activity

DreamCatcher (2020) - Sleep

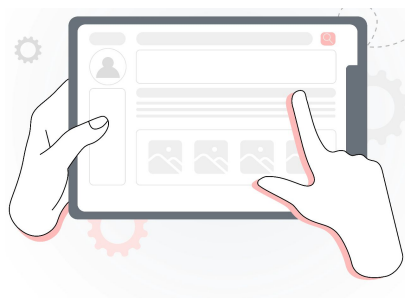**Family's social interaction and emotional health**

Can we design and build a family informatics system that support reflection of family members' affective and behavioral states from family interaction?

Study overview

System design

Ideation

Scenario building

Prototype

FamilyScope

User study

Data collection

User study
(N = 30, 10 families)

Evaluation

Post-interview
(N = 30, 10 families)

FamilyScope

To explore the social and emotional health of our family,

FamilyScope

Family activities | Eating | Media Watching | **Board Game** | Cleaning

What is FamilyScope?

Through physiological(e.g., heart rate, skin conductivity) and behavioral data collected during familial activities,we provide visualized information about **how aroused, stressed, and active** family members were.

How to use FamilyScope?

"Try to explore how our family interacted using video and visualized data!"

Based on the personal data-driven threshold, we show the degree of emotional arousal, stress, and behavioral activeness in **4 levels(Low/Moderate/High/Very High). The darker the color, the higher the level.**

1. Look at individual-level graphs to see how data change over time.
2. Compare family data with individual- and family-level graphs.
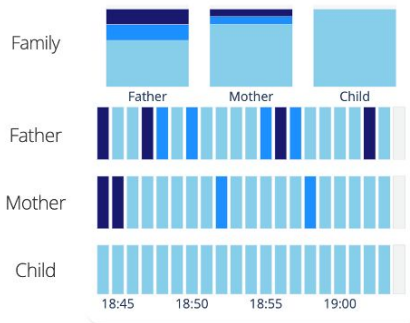3. Click a data point on the individual-level graph to see the video at that time.

Emotional Arousal Level | Stress Level | Behavioral Activeness Level

Observation items

- <mark>Affective involvement</mark>
- <mark>Affective responsiveness</mark>
- Behavioral patterns
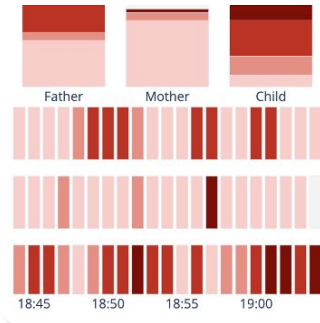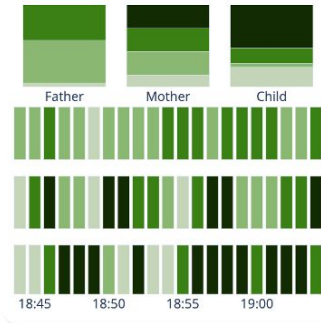
FamilyScope

Affective involvement &
responsiveness
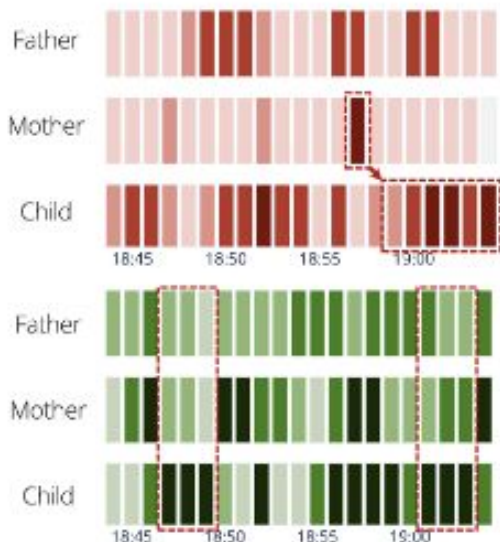
Affective involvement

Affective responsiveness

Individual-level view
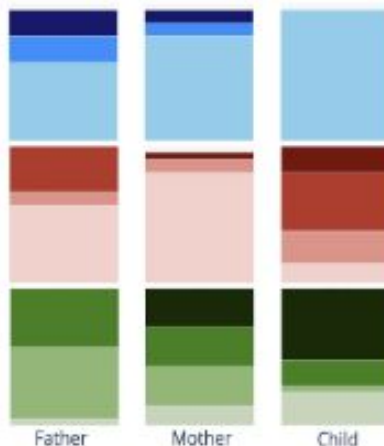
Family-level view
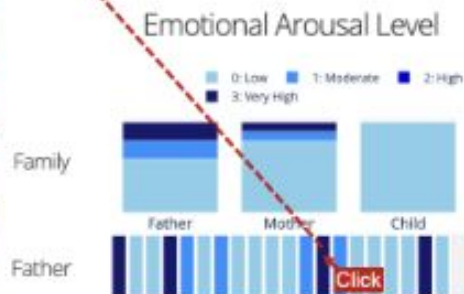
Data-to-video navigation

User study procedure

Orientation → Family activities (Data collection) → Exploring FamilyScope → Post-Interview

Data collection setting

 Empatica E4
- Physiological data collection

 Smart camera
- Family activity recording

Meditation

User study procedure

Orientation → Family activities (Data collection) → Exploring FamilyScope → Post-Interview

Family mealtime → Media watching → Boardgame → Cleaning (20min each)

User study procedure

Orientation → Family activities (Data collection) → Exploring FamilyScope → Post-Interview

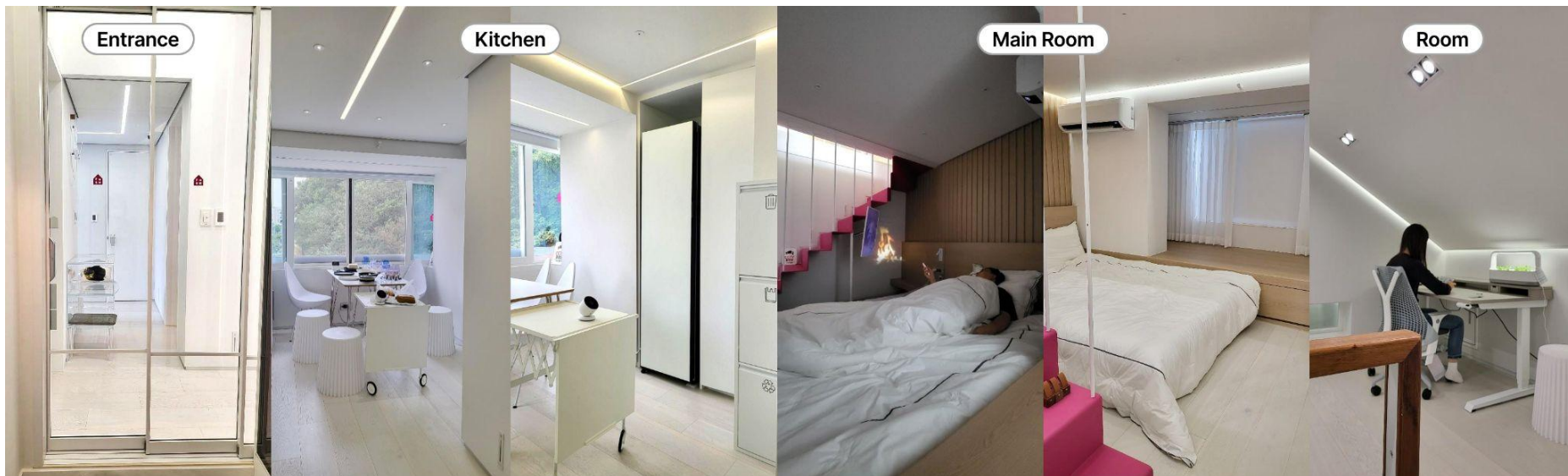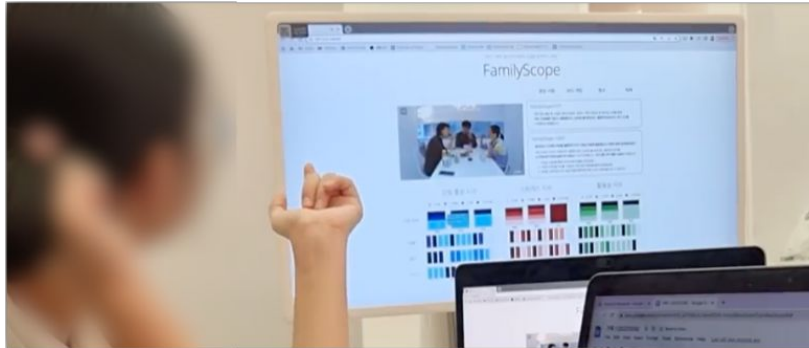| Shared activity	Questions
Mealtime	How did we change our feeling while eating meals? (R)
	Did we feel similar/different feelings while eating? (I)
Media watching	How did we feel about the emotional video content? (R)
	Did we feel similar/different feelings while watching videos? (I)
	Was there anyone who could not focus on the video? (I)
Board game	Did the family member get stressed or excited during the board game? (R)
	When did we participate in the board game most actively? (I)
	Who was the most excited/stressed family member during the board game? (I)
	Did we feel similar/different feelings while playing the board game? (I)
Cleaning	Did we get stressed due to someone not actively participating in cleaning? (R)
	Did we feel similar/different feelings while cleaning the room? (I)

User study procedure

| Orientation | Family activities (Data collection) | Exploring FamilyScope | Post-Interview |

Theme	Sub-theme	Description
Perceived usability	Data types	Appropriateness of the data types and their representations
	Data visualization	Perceived usability in data visualization features
	Data-to-video navigation	Perceived usability in video recording feature
Reflection (What)	Confirming the old	Participants' existing perceptions of a family
	Discovering the new	New insights discovered from family members
Reflection (How)	Self-reflection	Interpretation of personal data led by an individual
	Co-reflection	Family members' collaborative discussion on family data
User perceptions on family data reflection	Positive	Positive perceptions on family data reflection
	Negative	Negative perceptions on family data reflection

Perceived usability

Affective state (Physiological & Physical data)

Behavioral state (Family interaction recordings)

*"Looking at myself and my family members through the data made me feel like I'm in the family TV reality show. You know, the counselors keep track of you and your family's footage and directly assess what the issue was. ... So the **quantified data kind of makes you look at you and your family from a distance, which means you can get an objective point of view**."*

Family data reflection

Confirming the old

*"I feel as if these **data are mirrors**. Daddy is stress-free all the time. He's hardly ever influenced by anything! See? Even with such a sad scene, no big change. Mommy, as always, is sensitive. My son, he can't stay still for just a minute at our house, and I can also see that while we're watching the very sad video.."*

Discovering the new

*"It's usually hard to notice how angry or sad my husband is because he doesn't express himself well. **His emotional arousal and stress are the highest among us** when playing games, but he doesn't even blink his eyes! I'm quite surprised to find out that my husband is such a good actor."*

Family data reflection

Collaborative thinking processes involving affective interactions to reach new intersubjective understandings

Similarities/Dissimilarities in emotional tendencies

"Since this testbed is a new environment, I think we all were very aroused. We were still getting used to the environment in the first activity. My wife and my kid also seems uncomfortable at first, but I think we all became relaxed after a while."

Observing and exploring other family members' emotional status

"I've never thought how sensitive my dad is. He said it's because of the work and I feel kind of sorry that he is very stressed at work and it also affects his mood."

User perceptions on family data sharing & reflection

Positive - Family data as a common asset

"I think it's okay to share and view each other's data. By looking at the data, you can better understand your spouse and your kid. Besides, there's nothing much to hide! We are family."

Negative - Privacy concerns and data inaccuracies

"I was quite embarrassed when my parents would stare at my data and have active discussions on my status. This is a privacy invasion!"

"Feelings are feelings! If you turn them into numbers, is that the definite answer? I'm worried about highly relying on this type of system to assess myself and others' emotions."

Summary

#1. Beyond Self-Reflection: Co-Reflection with Family Data

- Collaborative reflection enables intersubjective understanding and promote mutual awareness

#2. Discoveries: Old & New

- Forming a "similar build" that shares characteristics of their data → Defining what is emotionally healthy family
- Discovering new insights → Of self disposition and others' hidden emotions

#3. Concerns on Family Data Reflection through Passive Sensing

- Positive - Supporting healthier family communication and understanding
- Negative - Data misrepresentation and privacy concerns

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Designing Tools to Support Family Data Reflection

- Offering explanations to automatic detection of affective states

- Controlling automatic self-disclosure levels for privacy preservation

- From intra- to inter-family reflection

In the job market & Open to research opportunities!

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