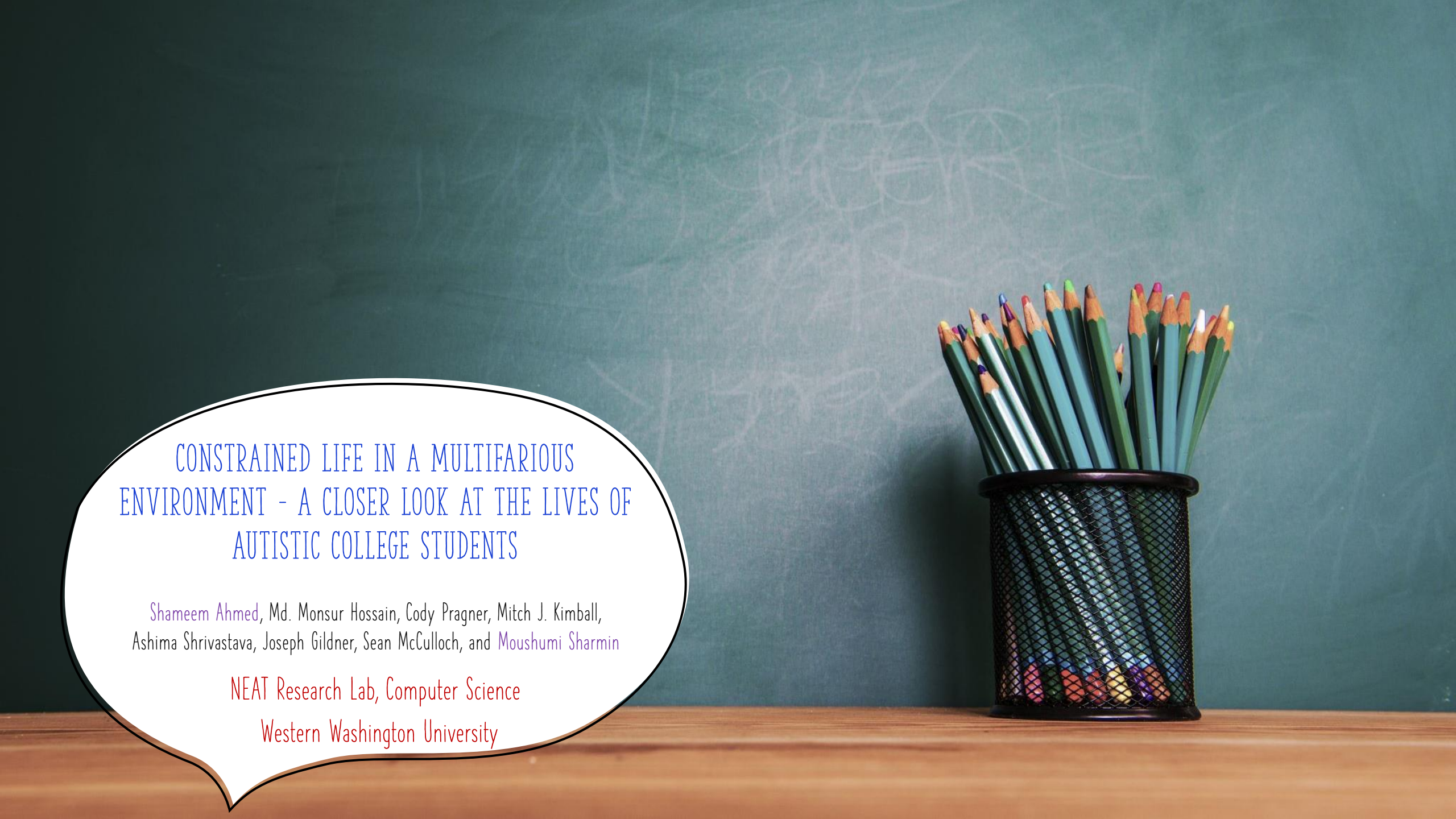

CONSTRAINED LIFE IN A MULTIFARIOUS ENVIRONMENT - A CLOSER LOOK AT THE LIVES OF AUTISTIC COLLEGE STUDENTS

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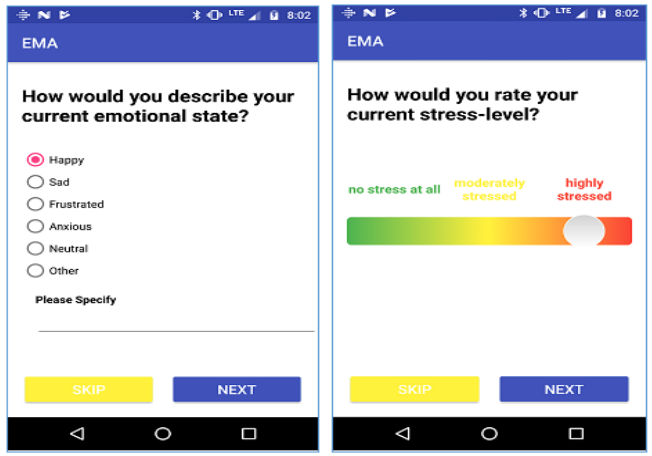
RESEARCH GOAL

- Get deeper insights into the lives of autistic college students
- Understanding feasibility of collecting objective, continuous, and personalized data from autistic college students from their natural environment using lightweight, commercially available wearable sensors.

STUDY METHODOLOGY

- Mixed-method study with 20 college students (10 autistic and 10 neurotypical)
- Study consisted of a pre-interview, followed by a week-long field study, and a post-interview



PARTICIPANTS

Gender	Age (Years)	Education
ASD: (Male: 7, Female:2, Non-binary: 1) Neurotypical (Male: 5, Female: 5)	ASD: 18-35 Neurotypical: 18-25	Freshman: 5, Sophomore: 2, Junior: 1, Senior: 2, Associate degree: 1, N/A: 9

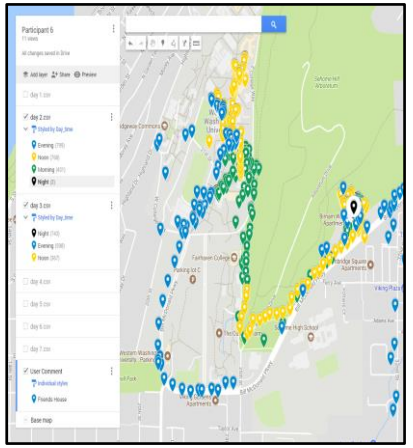
DATA COLLECTION: PRE-INTERVIEWS

Pre-interview	How important is it for you to get a college degree? Please explain why you consider it important.
	What was your expectation about college life before coming to college?
	What kinds of challenges do you face at your college?
	* Could you share with us when you were diagnosed, and what was the process of diagnosis?
	* Apart from your family members, who else is aware that you are on the spectrum?

Sample questions asked during interviews (*Questions asked only to autistic participants)

DATA COLLECTION: FIELD STUDY

- From the field study
  - 1,737,625 units of heart rate
  - 318,863 units of geo-location
  - 315,345 units of step count
  - 1,146.3 hours of sleep
  - 442 EMA (Ecological Momentary Assessment) responses, answering 5,336 individual questions



Visual analytic tools - Location Plotter

Visual analytic tools -Sleep Analyzer

EMA	How would you describe your current emotional state?
	Were you engaged in social interaction in the last 30 minutes?
	Have you participated in any group activity in the last two hours?
	How would you rate your current stress level?

Sample questions asked using EMAs

DATA COLLECTION: POST-INTERVIEWS

Post-Interview	Did you participate in any (academic) group projects during this study?
	Did you participate in any social activity (club, sports) in your college during this study?
	On a scale of 1-5 (1= very uncomfortable, 5 = very comfortable), please rate the comfort level of the wearable.
	What features of wearable technology did you like/dislike?

FINDINGS: STRESS EXPERIENCED

- There is no significant difference in stress experienced by autistic and neurotypical college students
- However, lower perceived stress of autistic students is a product of careful stress management

		ASD	Neurotypical
Self-Reported Stress	# of stress reported	30	82
	Average stress	3.56	3.51
	Min stress reported	0	0
	Max stress reported	7	9
Stress reported via EMA	# of stress reported	181	227
	Average stress	2.82	3.14
	Min stress reported	0	0
	Max stress reported	9	9
Stress reported via EMA + Self-Reported Stress	# of stress reported	211	309
	Average stress	2.93	3.24
	Min stress reported	0	0
	Max stress reported	9	9

FINDINGS: STRESS FACTORS AND MANAGEMENT

- Neurotypical students didn't have specific strategies for stress management or thoughts about stressors but accepted that "college life will be stressful" as a fact of life.

"Last week I had two essays due, an exam on Wednesday, and then [another one] on Friday…I didn't spend the last weekend doing homework. So, it was all piling up, so it was kind of stressful. I was doing things like last-minute [on] Friday. I made plans for Friday afternoon with a friend, but I wasn't able to enjoy myself because I had something to do that night at midnight, and I waited till Friday to do it, and so I was kind of stressing out." (P11, F, Anthropology, Neurotypical)

- Autistic students were very aware of potential stressors and mentioned using specific stress management strategies.
  - Carefully planning their academic workloads
  - "Extensive research" to find a manageable course load
  - More structured in their routines
  - Less willing to expose themselves to unknown situations and potential stressors.

"I don't want to be over-occupied… Right now, with 14 credits, I'm pretty comfortable with the workload that I have. Over time I'll probably try taking more credits at the same time, but I don't want to end up in a situation where I have too much to handle." (P14, M, Freshman, Major undecided, ASD)

FINDINGS: NAVIGATION

- Autistic students' navigation pattern is limited to the types of places and distances covered compared to that of neurotypical students
- Autistic students were highly focused on various academic buildings, work (when applicable), and home while neurotypicals went to socialize at friends, clubs, etc.
- Autistic participants stayed at home, dormitory, or school 86.93% of the time, while neurotypical participants stayed at those places 77.18% of the time.
- Neurotypical participants visited the houses family and friends 10.37% of the time while our autistic participants never reported any such visits during the study.

ASD	%	Neurotypical	%
Home/Dorm	68.84%	Home/Dorm	60.17%
School	18.09%	School	17.01%
		House Family, Friends	10.37%
Work	0.50%	Work / Going to work	5.39%
Library	1.51%		
Café / Dining Hall	3.52%	Restaurant	1.24%

Participants' self-reported current location (collected via EMA)

"I do my tutoring. So [I] usually [go to] just home, school, then tutoring then home again. It's just my every day. I went grocery shopping once or twice." (P14, M, Freshman, Major undecided, ASD)

"I usually stay home on Saturday and Sunday." (P4, M, Junior, Physics, ASD)

FINDINGS: SLEEP

- We did not observe a significant difference between autistic and neurotypical students sleep length.
- However, we found a significant difference when we only considered REM (Rapid Eye Movement) sleep.
  - REM plays a significant role in emotion regulation and memory, and too little REM has negative consequences on health.
  - Autistic participants had 13.5% REM (lower than the normal range), while neurotypicals had 19.5% REM (close to the normal range).

	ASD (minutes)		Neurotypical (minutes)	
	Mean	std. dev	Mean	std. dev
Time in bed per day	560.1	45.7	502.6	157.2
Awake time per day during sleep cycle	74.8	15.4	57.0	22.2
Actual sleep time per day	485.3	37.8	444.4	139.6
REM sleep per day	75.8	24.4	98.1	44.9
Light sleep per day	256.2	60.8	228.7	102.2
Deep sleep per day	64.3	18.2	79.7	33.7

FINDINGS: SOCIALIZATION

- Autistic students expected to have 'a better social life' – expecting college life to be more 'inclusive and socially acceptable of autism.'
- Autistic students expected to make more friends but found it difficult to learn the acceptable social norm, which involved accepting and adopting the standard of social norms.
- Autistic participants made conscious efforts to maintain their friendships established before coming to college.
- They primarily maintained their friendships through digital platforms (e.g., texts, Facebook, Skype, online forums).

"I was expecting to [be] able to find more people who have things in common with myself and being able to talk to more people." (P13, M, Freshman, Major undecided, ASD)

"If everyone's acting in one way, and you're acting in a different way, I say that you're acting strangely because you're the one doing something different." (P13, M, Freshman, Major undecided, ASD)

KEY INSIGHTS

- Perceived stress is influenced by personal stress management capabilities, and normalization would offer better awareness pertaining to stress value
- College experience of autistic students can be improved by focusing on embracing autism and accepting differences in social communication
- Stress prediction technology can help in improving overall college experience
- Mixed-method studies can offer insights that can be difficult to gain using only qualitative or quantitative approach