

Measuring Performance of Direct Support Shift Changes in Independent Living

Short Shifters:

Scott Guirlinger, Andrew McFarland, & Eric Weflen

HCI 681

11/17/2020



Project Notes (REMOVE)

Notes from the assignment sheet:

- 1) Define the work task and interactions that occur.
- 2) Define the roles in the interaction (how many people, agents, etc., and what does each do?)
- 3) Define metrics of interest
- 4) Give examples of applying those metrics to your task and the interactions.
- 5) Either evaluate whether the metrics you chose are predictive of what you want to measure, perhaps by correlating them with other measures, or describe in detail how you would evaluate your metrics if you had more time / resources.
 - Each group will have 15 minutes to present its work
 - Be sure each group member speaks during the presentation.

Meet the Short Shifters



Scott Guirlinger
Norfolk, VA

Grew that beard out of
COVID boredom



Andrew McFarland
Boston, MA

Just bought a house in
Pawtucket, RI



Eric Weflen
Ames, IA

Recently purchased
an 80's Toyota car as
a project

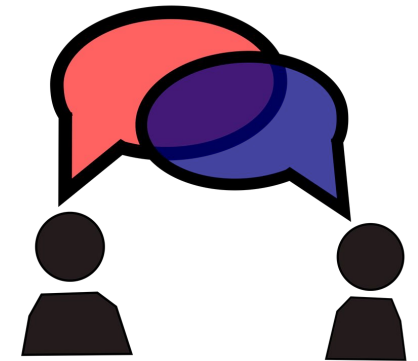
Shift Changeover

the task that takes place anytime one worker's shift ends and another worker's shift begins

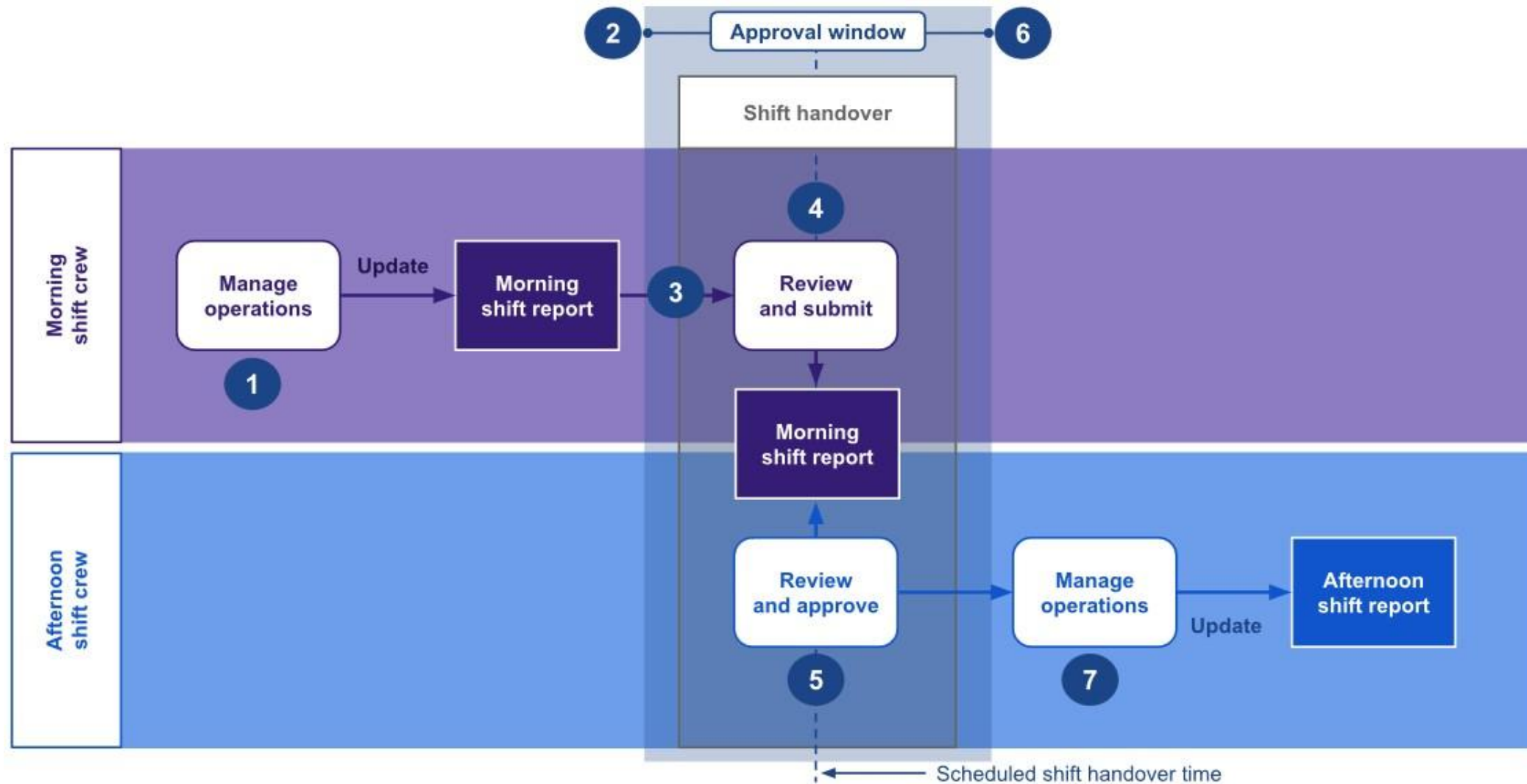
To ensure a smooth and successful transition, shift changeover typically requires the team members to efficiently communicate:

- the current **state of the system**, particularly anything abnormal, and
- any pending **action items**

Communication can be **verbal** and **non-verbal** (e.g. body language, documentation, or shared artifacts)

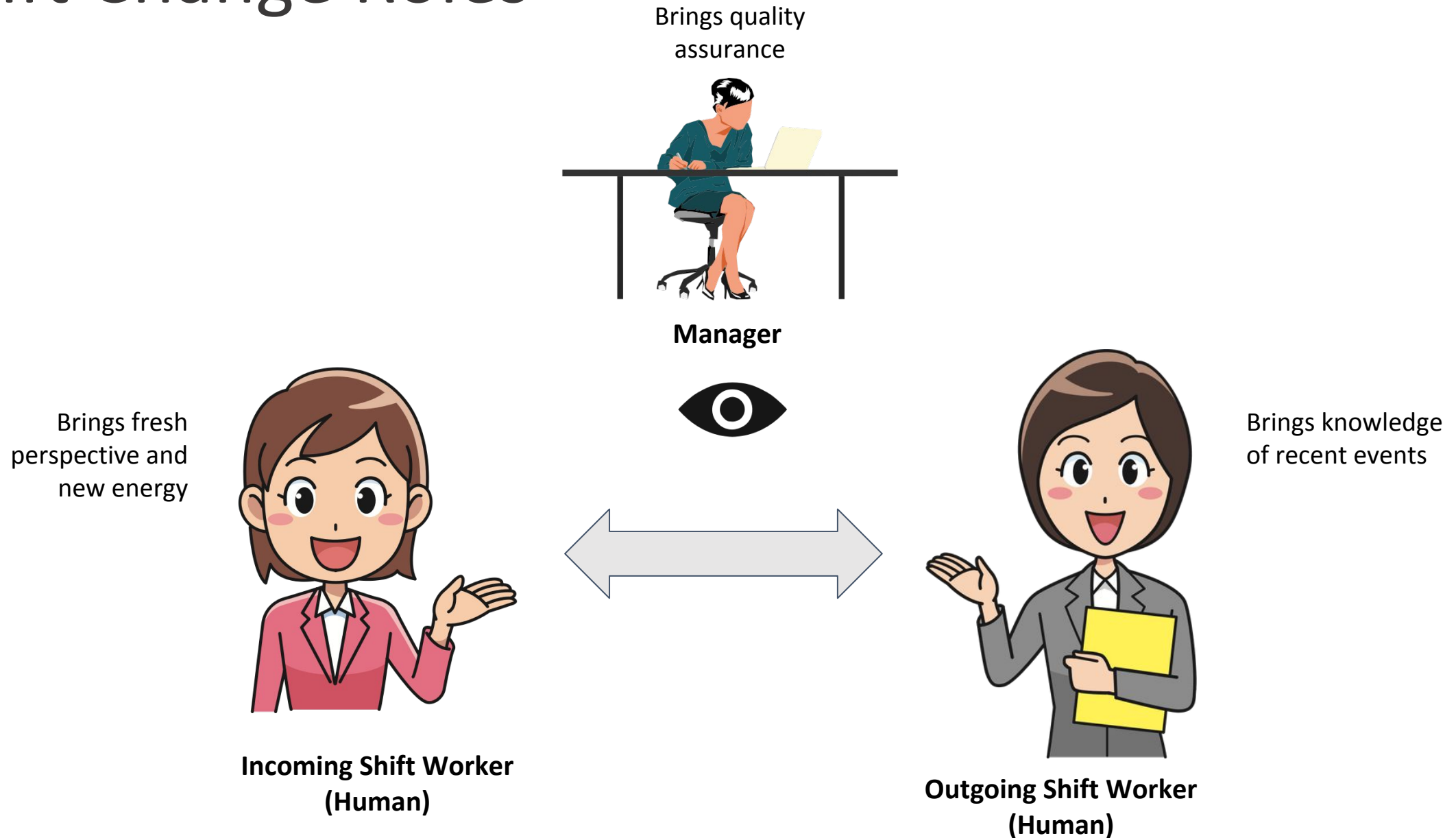


Example Shift Changeover Process



Shift Change Roles

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Our Study: Direct Support Professionals (DSPs)

“people who work directly with people with physical disabilities and/or intellectual disabilities with the aim of assisting the individual to become integrated into his/her community or the least restrictive environment”
(Wikipedia, n.d.)

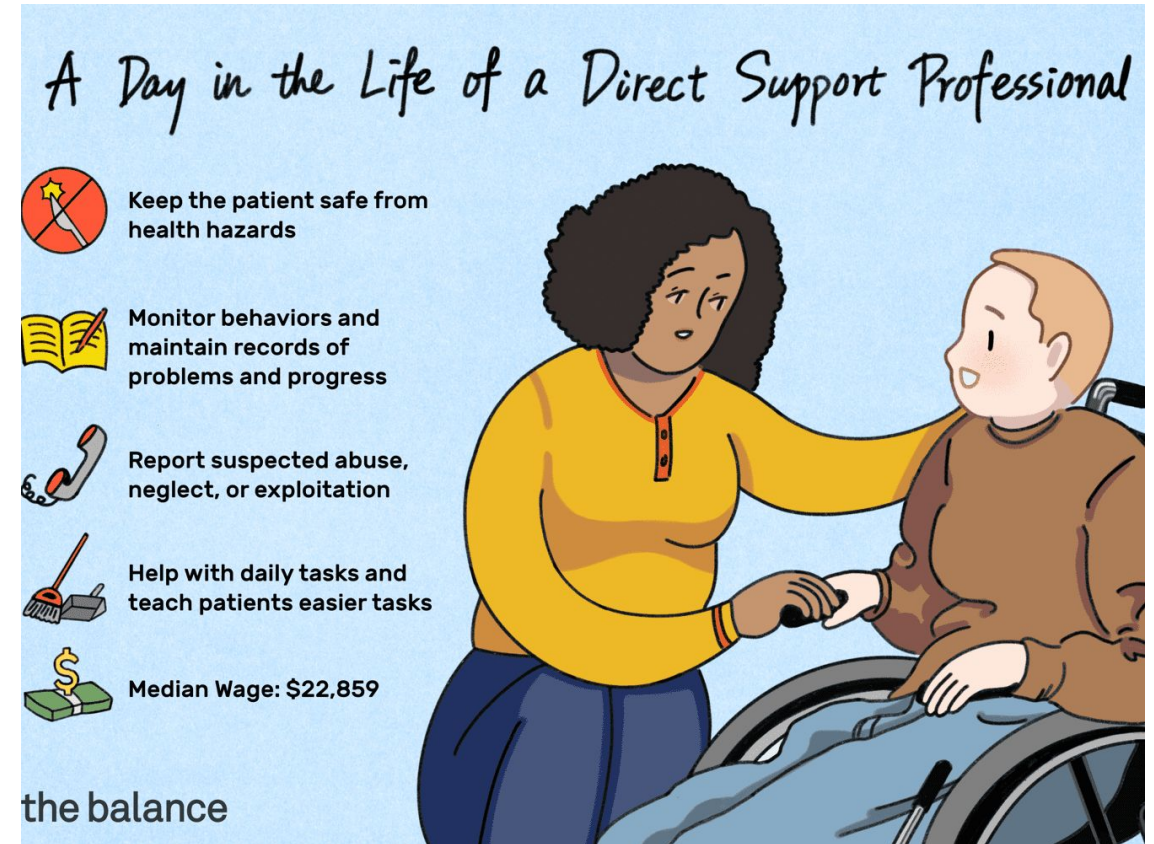


Image source:
<https://www.thebalancecareers.com/government-job-profile-direct-support-professional-1669627>



Hope House Foundation (HHF)

- 50+ years of providing services
- Supporting 120+ individuals in their own homes
- DSPs are grouped into teams by location and have coverage 24/7, so shift changeovers take place multiple times each day



More information at www.hope-house.org

Image source: <https://www.hope-house.org/>

Demographics in our study



- 2 teams/locations
- 100% native English speakers
- 7 female (88%), 1 male*
- 5 Black/African-American, 3 white
- 1.5 - 8 years of experience (average 3.5 years, SD = 2.2 years)
- Majority had known other worker between 6 and 24 months

* Previous studies saw similar gender bias in the DSP field: <https://onlinelibrary.wiley.com/doi/full/10.1111/jir.12616> (84% female in sample size of 217)

Parameters of DSP Shift Changeover

- Typically 3 shifts/changeovers per day:
 - AM, PM, Overnight
- HHF DSP changeovers are not 1-for-1; shift overlap is scheduled
- HHF DSP shifts are specifically scheduled but changeovers are not
 - Changeovers happen as DSP schedules allow



Image source: <https://www.hope-house.org/>

Shift Changeover Effectiveness

- Successful changeover is “measured” by an absence of errors and client satisfaction, i.e. everything goes smoothly
- Consequences of poor changeover include:
 - Medication errors
 - Incomplete tasks
e.g. laundry, cleaning, or meals
 - Missed appointments
 - Duplicated tasks
e.g. two dinners, leading to overfeeding
 - Upset clients



Image source: <https://www.hope-house.org/>

Communication Tools used by DSP Teams

Direct Support Records

Official records of activities sent to admin office for billing

HOPE HOUSE FOUNDATION IN-HOME WAIVER DAILY SUPPORT ROUTINE (DSR) 11/13/2020

Name: _____ Legend: Hn = Hours, TP = Time Period, SB = Skill Building Outcome, Add'l Doc = Additional Documentation, MAR = Medication Administration Record, DM = Daily Note, CL = Checklist, ON = Overnight, O = Outcome Number

Month/Year: CSC November Meeting 3

Signature (1st Initial, Last Name) in a box means the support was provided. A circle in a box means support was not provided as planned - a dated explanation will be written and signed on the back in the Support Log.

Hrs	TP	Activities	O #	Add'l Doc	Freq.	Sun	Mon	Tue	Wed	Thu	Fri	Sat
0.25	AM	AM Hygiene Routines	1		Daily							
0.25	AM	Prong Reminders to Brush Teeth	2		Daily							
0.5	AM	Assist to Bathroom prep/Cleanup	3		Daily							
0.5	AM	Prong Reminders to Physical Activity/Grooming	4		Daily							
0.25	AM	Check Sun Meds Taken Reminders	5	285	Daily							
0.25	AM	Prong to Communicate Concepts to Staff	6		Daily							
0.25	AM	Organize Crafts	7		1 x wk							
0.75	AM	Meet with Team Leader	8		1 x wk							
Hn Actual Hours						2.25	2	2	2	2	2.50	2
DM Actual Hours												
0.5	AM	Grocery List-Meal Planning	9		1 x wk							
1.5	AM	Grocery Shopping	10		1 x wk							
0.5	AM	Clean Bedrooms	11		2 x wk							
0.5	AM	Expanded Art and Crafts skills	12	280	2 x wk							
0.5	AM	Plan Activities-Calendar with Staff or CSC	13		1 x wk							
1.5	AM	Community Activity	14	285	3 x wk							
0.25	AM	Prong to Communicate Concepts to Staff	15		Daily							
0.25	AM	Prong to Change Sheets	16		1 x wk							
0.75	AM	LAPE Meeting Discussion	17		4 x wk							
0.25	AM	Check Mail Apartment for Important Mail	18		6 x wk							

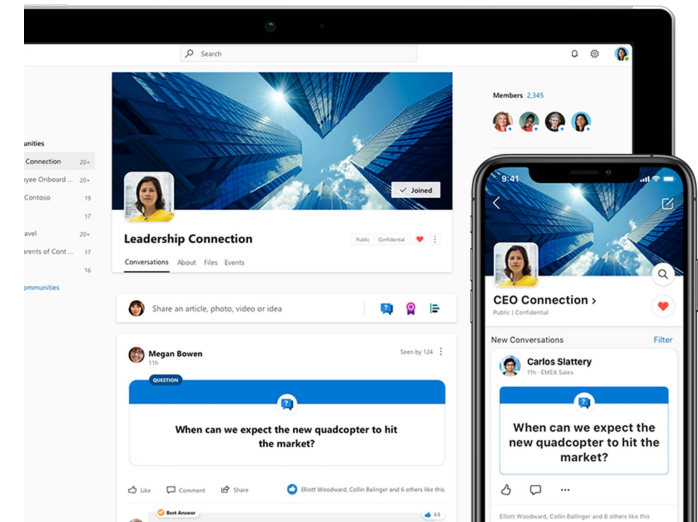
Shared Calendar

Wall calendar or whiteboard in common area of team office



Online Logs

Informal communication between staff members on Yammer



Research Questions

- Can **verbal and non-verbal cues** be measured to predict a worker's perception of the **effectiveness** of a shift changeover?
- Can **verbal and non-verbal cues** indicate the **level of comfort** between incoming and outgoing shift workers?
- Are external communication tools necessary to create a positive perception of a shift changeover? If so, how often must they be referenced? (*later excluded from the study*)

Literature Review

- Limited opportunities to ask questions can negatively impact shift changes (Anders et al., 2016; Patterson et al., 2005)
- Interruptions and distractions can negatively impact shift changes (Anders et al., 2016)
- Shift change is an effective way to mitigate employee anxiety (AM et al., 2008)
- Social interruption or lack of attention may have negative impacts on shift changes (Patterson et al., 2005)



Literature Review

Metrics used in measuring shift change effectiveness:

- Duration of shift change
- Location
- Mode
 - Written
 - Verbal
- Type of communication
 - Question
 - Interruptions
 - Statements

(Anders et al., 2016; Patterson et al., 2005)



Metrics

Possible Metrics:

1. Number of questions (verbal cues)
2. Eye contact (Non-verbal cues)
3. Tone of meeting? (verbal content cues)
 - a. I lean toward doing something like this that's out of the ordinary because the assignment states that we are supposed to be pushing the state of the art on methods for measuring performance. Our other two methods seem to be fairly standard in literature, but by throwing in a non-standard method, maybe we can attempt to validate or invalidate it using the other two?

For Each metric:

- b. relation to other 2 metrics (is there a relation?)
- c. Does this relate to perceived effectiveness?
- d. Does this relate to their level of comfort with coworker

Example - possible analysis for “number of questions”:

- a. Does work experience related to **number of questions**?
- b. Does a DSP's comfort level with coworker related to **number of questions asked**?
- c. **Number of questions** in a change over related to perception of effectiveness?
- d. **Eye-contact** relate to **number of questions**?
- e. Level of joy, or other **tones** picked up in the meeting related to **number of questions**?

Metrics

Notes

- I think we have so many parameters that we need to show our setup in a matrix of some sort to help our audience understand

For each measure you develop, report at least these characteristics. You may add more.

Measure	Metric	Variable type (continuous, ordinal, categorical, etc.)	Data source (software logs, audio recordings, observations, etc.)	Collection frequency (every minute? Event- triggered? After activity? Etc.)	Threshold levels? Formulas?	Comments
Communication Balance	Ratio of max # of spoken utterances to min # of utterances on team per 10 minutes	Whole numbers / integers	Utterances recorded from push-to- talk microphone	Recorded through-out activity, then averaged	Count number of utterance starts for each team member in 10- minute period; divide max by min.	Higher (or lower) value does not equal better communication; it depends on change over time.

There's an example above that requires **machine learning for classification**. If you want to include a measure like that but don't have the skills or time to implement a machine learning system, describe clearly what the classifier training set would look like and what the output of the classifier would look like. We can discuss this more in class.

Metrics

Measure	Metric	Variable Type	Data Source	Collection Frequency	Threshold Levels	Comments
Verbal Communication	Number of questions	Whole number	Video recordings	Each time the event triggered	A question was marked when one participant made an inquiry of another	Prior research has demonstrated that a lack of questions can be detrimental to changeover effectiveness
Non-Verbal Communication	Amount of eye contact	Time duration	Video recordings	Each time the event started and stopped	Eye contact was captured when both the incoming and outgoing workers looked towards one another	Lack of attention could be a cause of ineffective changeover. Eye contact could indicate levels of attentiveness
Verbal Content Cues	IBM Watson “Joy” score	Text analysis score	Transcribed video recordings	After each interview	IBM Watson uses Natural Language Classifier, which combines inputs from SVMs and a Convolutional Neural Network to classify human language	The level of joy present in communication could indicate participants’ levels of engagement and comfort

Metrics

We also measured:

of acknowledgements

Time spent laughing

of interruptions

of distracting events

Time spent facing the other participant

of animated gestures

of times an artifact is referenced



Methodology

Notes

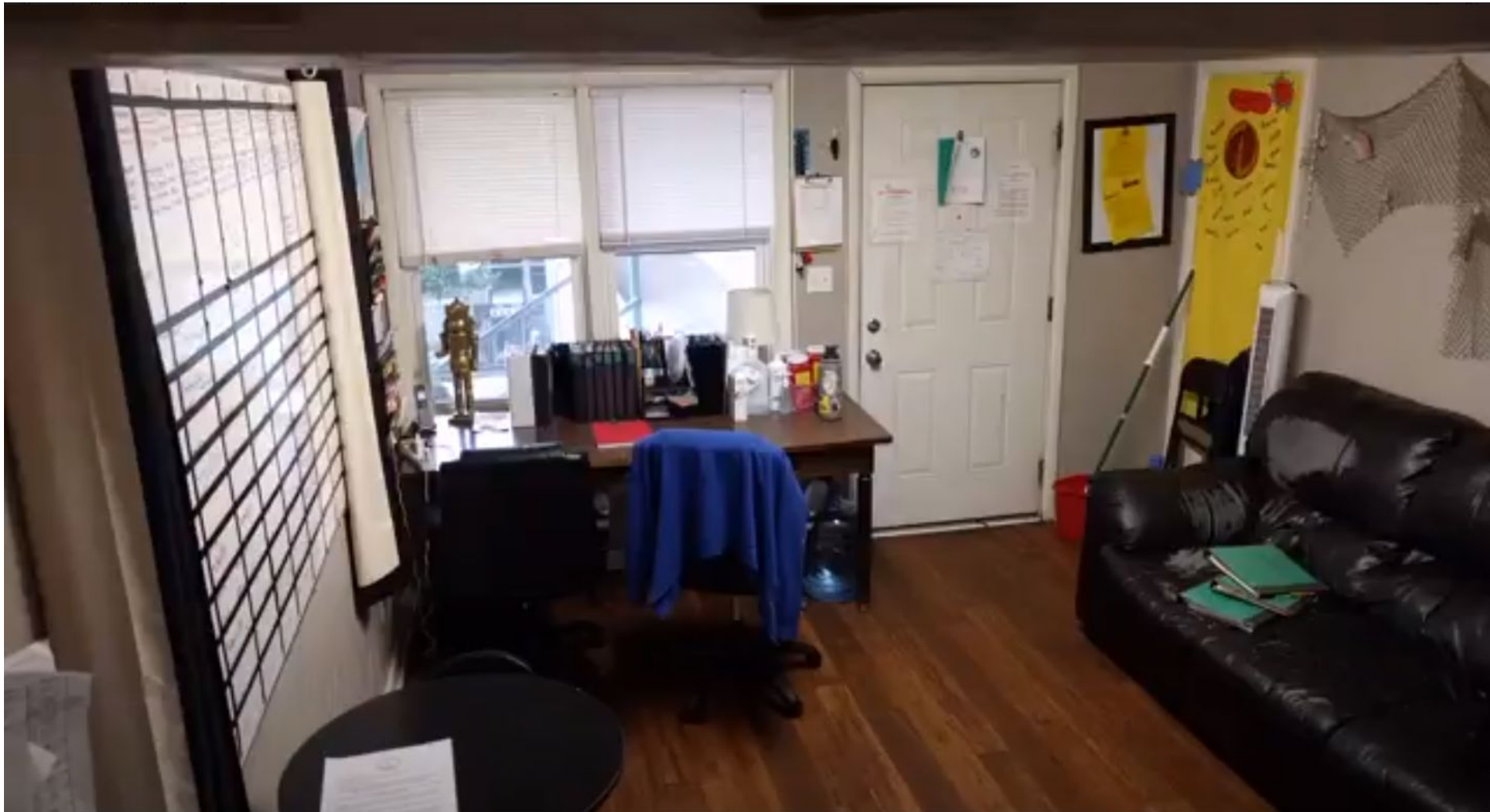
Answer questions like:

- How did you generate your example interactions?
- What biases or assumptions did you make as you approached the problem? It is important to be aware of these and note them so that you can account for them later. One way of probing for this is asking yourself, "If someone else did this project, how would it turn out differently, and why?"
- What we did and how we did it
 - Recorded video 4 shift changes
 - Gave questionnaire after
 - Used BORIS to classify utterances
 - Etc

Methodology

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Video Recordings



Methodology

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Questionnaires

Research Questionnaire

HCI 681, Fall 2020, Iowa State University

Please circle your responses to multiple choice questions. All responses will be kept anonymous.

Basic Demographics

1. Is English the primary language that you speak at home?

Yes No

2. To which gender identity do you most identify?

Female Male Non-binary Other _____

3. Are you of Hispanic, Latino, or of Spanish origin?

Yes No

4. How would you describe yourself? (circle as many as apply)

American Indian or Alaska Native
Asian
Black or African American
Native Hawaiian or Other Pacific Islander
White
Other _____

Job Experience

5. Approximately how long have you worked in this direct support professional (DSP) role or a similar role?

Shift Change

When reflecting on the coworker who is relieving you or to whom you are relieving on this shift change...

6. How long have you known this particular coworker?

Less than 1 month
1 month - 6 months
6 months - 2 years
2 years - 5 years
More than 5 years

7. How well do you feel you know your coworker?

1 = I hardly know them
2
3
4
5 = They are like family to me

8. How much are you willing to share with the other person?

1 = I'm only going to share what I have to with them
2
3
4
5 = I would entrust them with private personal matters

9. How would you rate the effectiveness of knowledge transfer on this particular shift changeover?

1 = Room for improvement
2 =
3 =
4 =
5 = Nailed it

Thinking about shift changes in general...

10. What level of impact do you feel a shift change has on your job?

1 = No impact
2 =
3 =
4 =
5 = Mission critical

11. Why do you feel knowledge transfer at a shift change is required?

12. What types of errors have resulted from miscommunication in past shift changes?

Thank you for your participation! If you have any questions or would like a copy of this research when completed, please feel free to contact Scott Guirlinger at 919-270-5189 or squirrel@iastate.edu.

Methodology


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Analyzed video footage in BORIS

Shift Change 2 - Short Shifters - BORIS

File Observations Playback Tools Analysis Help

Player #1



VID_20201026_160918_Trim.mp4: 00:00:00.000 / 00:02:45.717 | total: 00:00:00.000 / 00:05:31.440 (paused)

No focal subject

Events for "Shift Change 2" observation

	time	subject
1	00:00:05.403	Manager
2	00:00:06.902	Manager

Ethogram

	Key	Code	Type	Description	Category	Modifiers
2	Q	Questions	Point event	Questions of unsure Statements		
3	L	Laughs	Point event	Laughs		
4	I	Interruptions	Point event	Interruptions of the other person speaking		
5	S	Social	Point event	Social Support		
6	D	Distraction	Point event	Distracting event that interrupts the conversation		
7	F	Facing	State event	Body oriented towards co-worker		
8	E	Eye Contact	State event	Eye contact with co-worker		
9	R	Reference	Point event	Referencing one or more artifacts		
10	G	Gesture	Point event	Expressive body motion		

Subjects

	Key	Name	Description	Current state(s)
1		No focal subject		
2	1	Outgoing	Outgoing Person Primarily Driving the...	
3	2	Incoming	Incoming Person Primarily Driving the...	
4	3	Other	Other People who Interact During the ...	
5	4	Manager	Manager or supervisor present	
6	5	Outgoing 2	Second Outgoing Person	
7	6	Incoming 2	Second Incoming Person	
8	7	Incoming 3	Third Incoming Person	

|x1.000

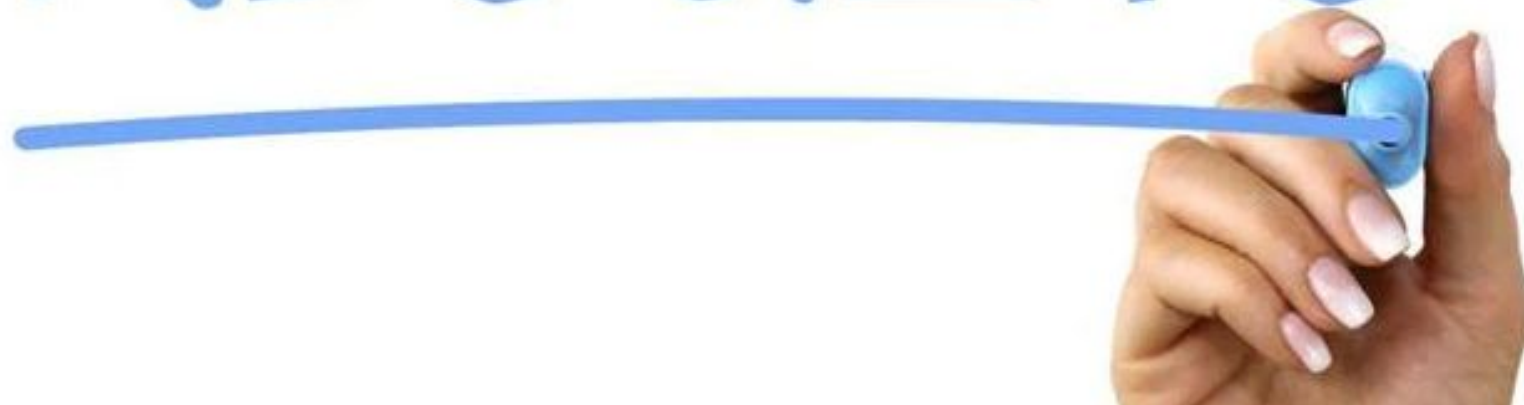
Methodology

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Transcribed sessions using otter.ai, then used Grammarly's Tone Detector and IBM Watson to detect the primary tones used in the shift change meetings



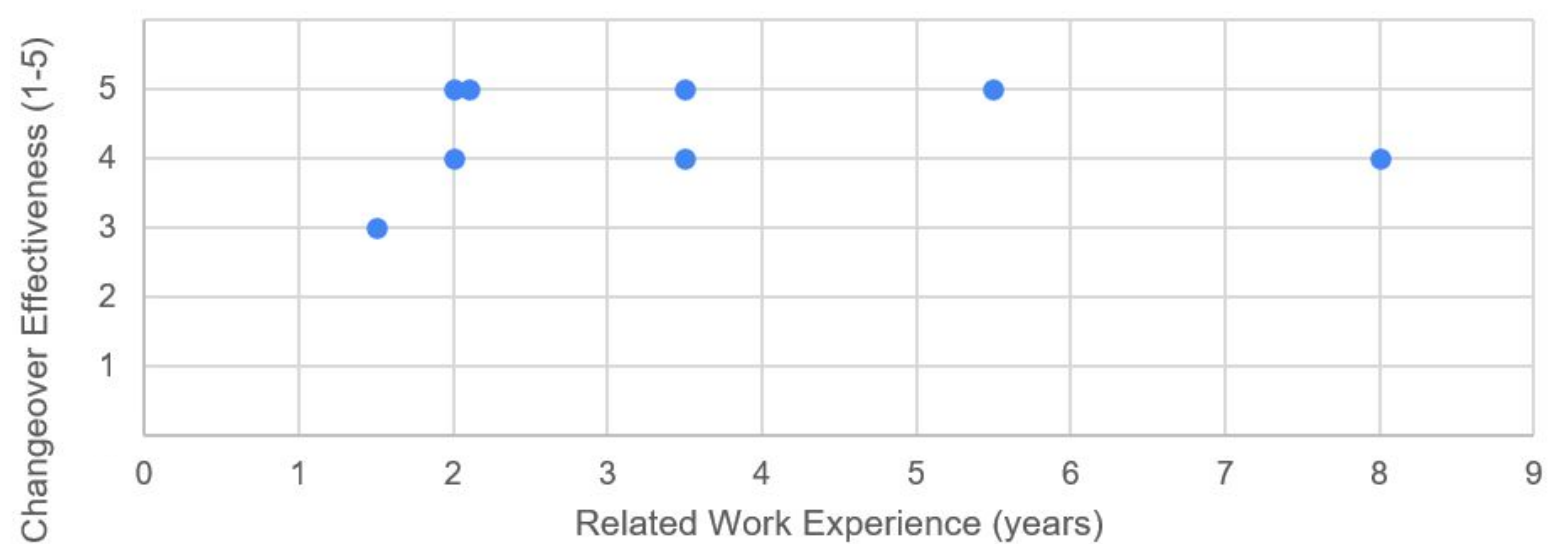
RESULTS



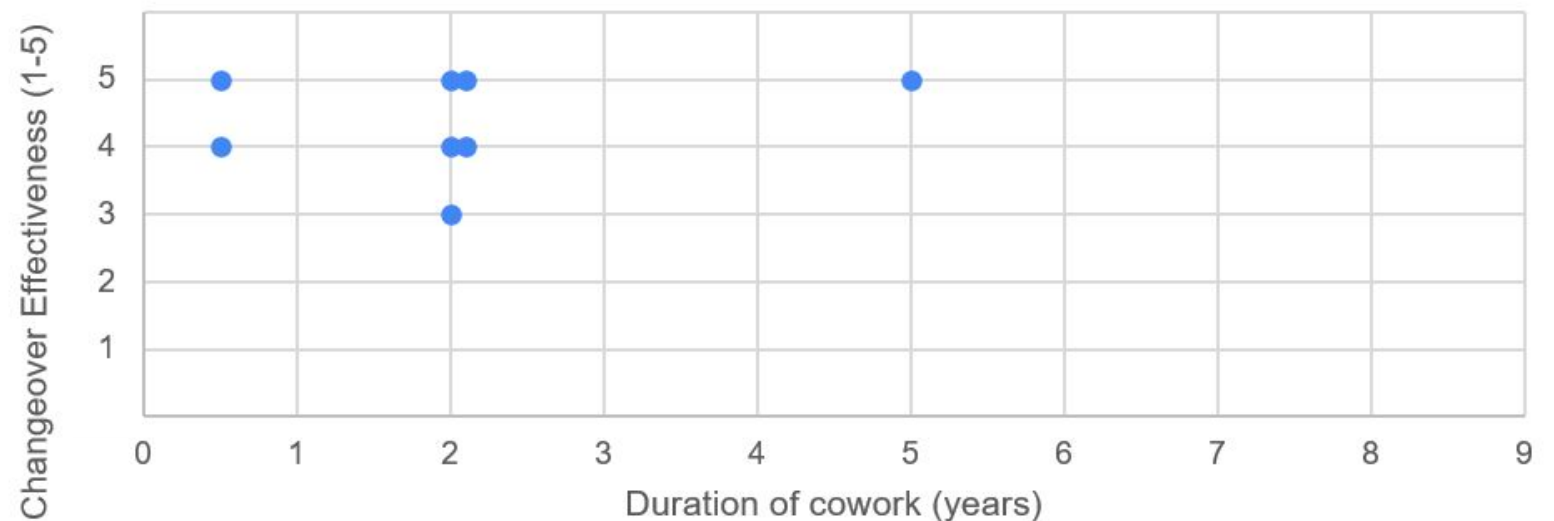
Duration of Work Experience

How long have you worked in a DSP role?

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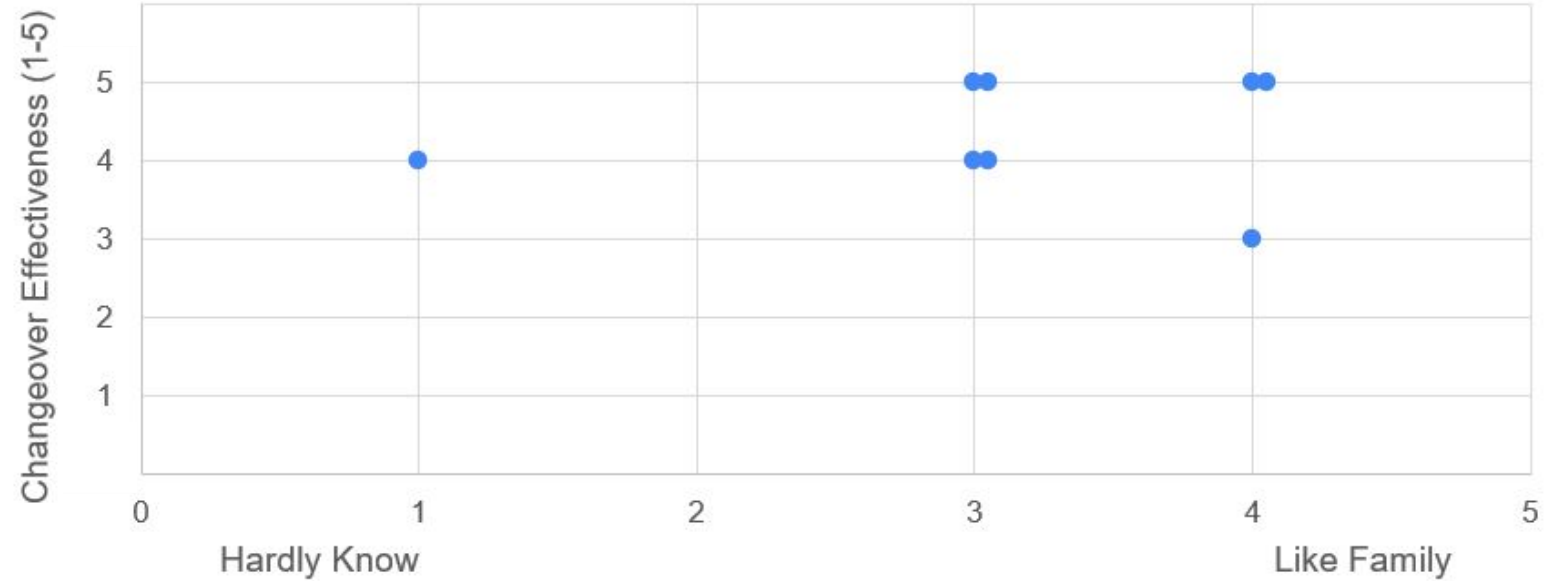
How long have you known this coworker?



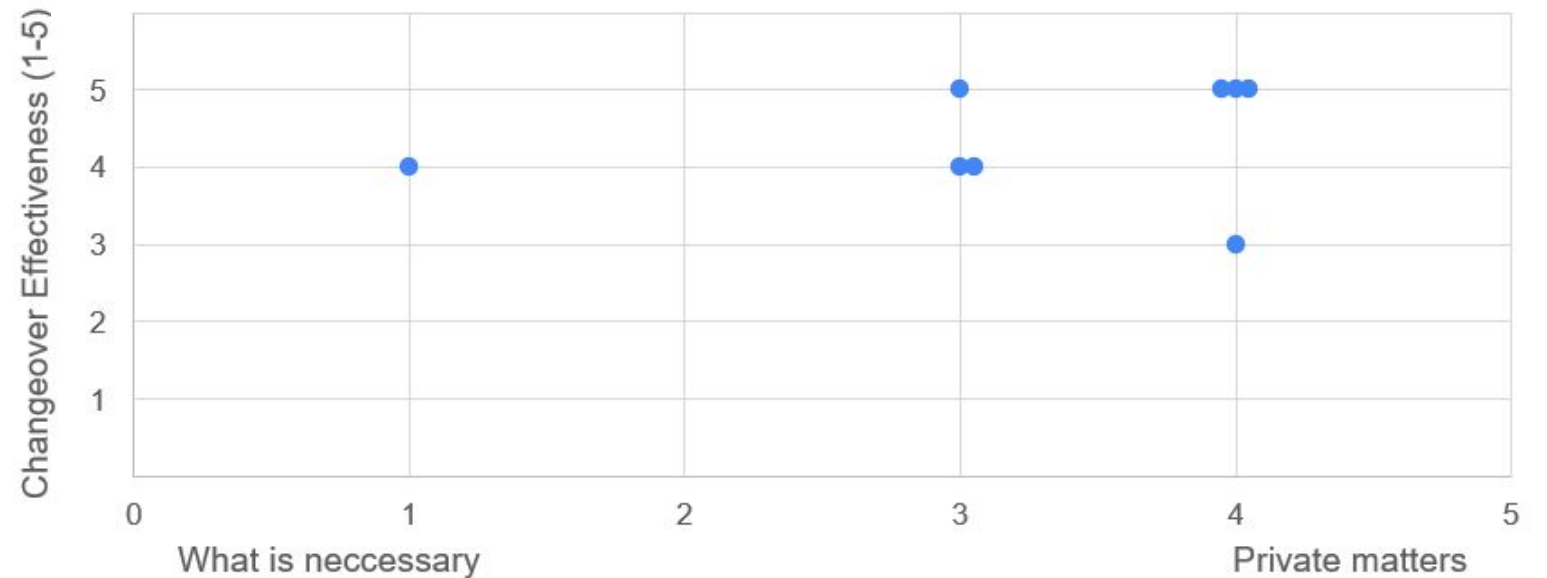
Quality of Work Relationship

How well do you know your coworker?

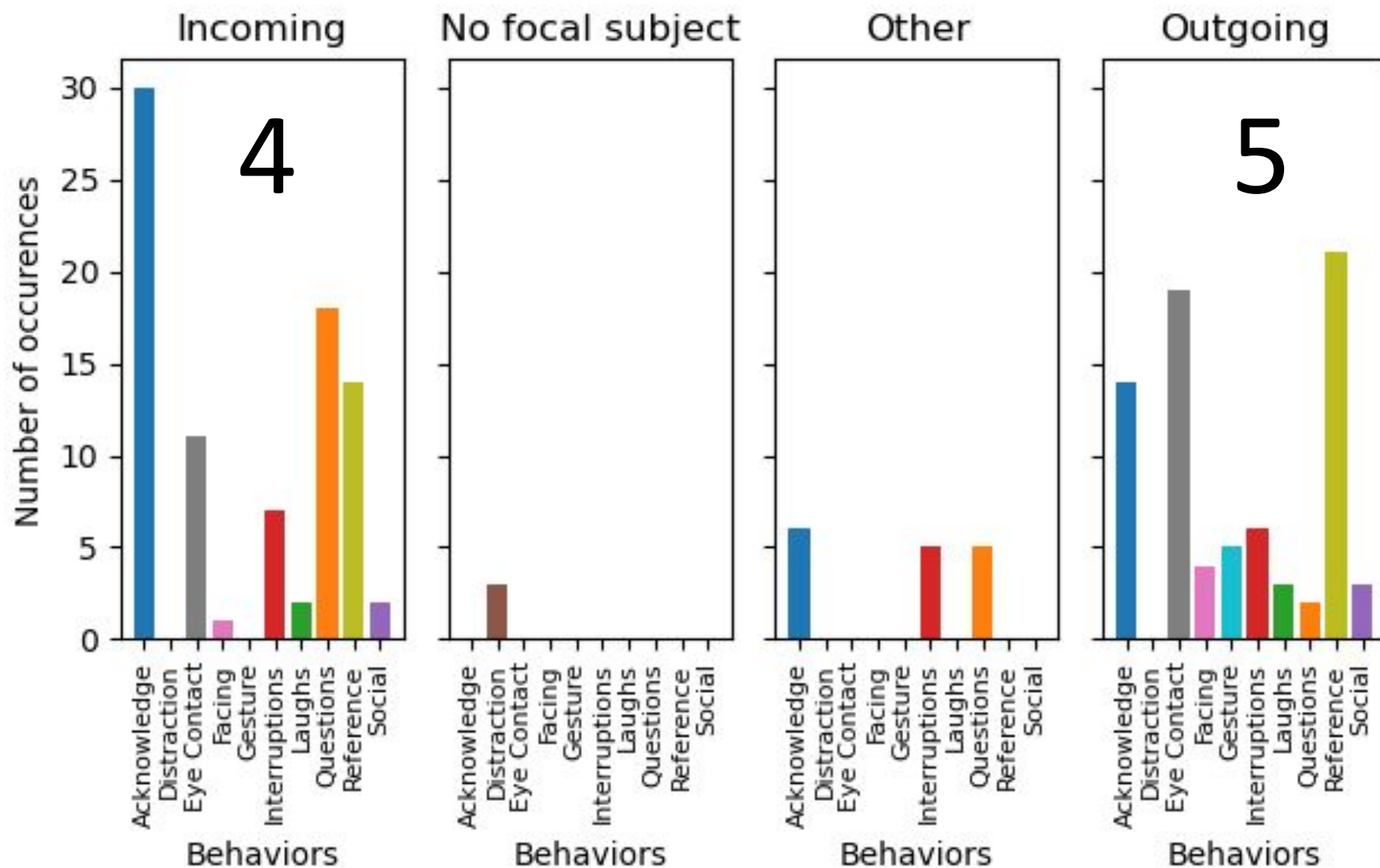
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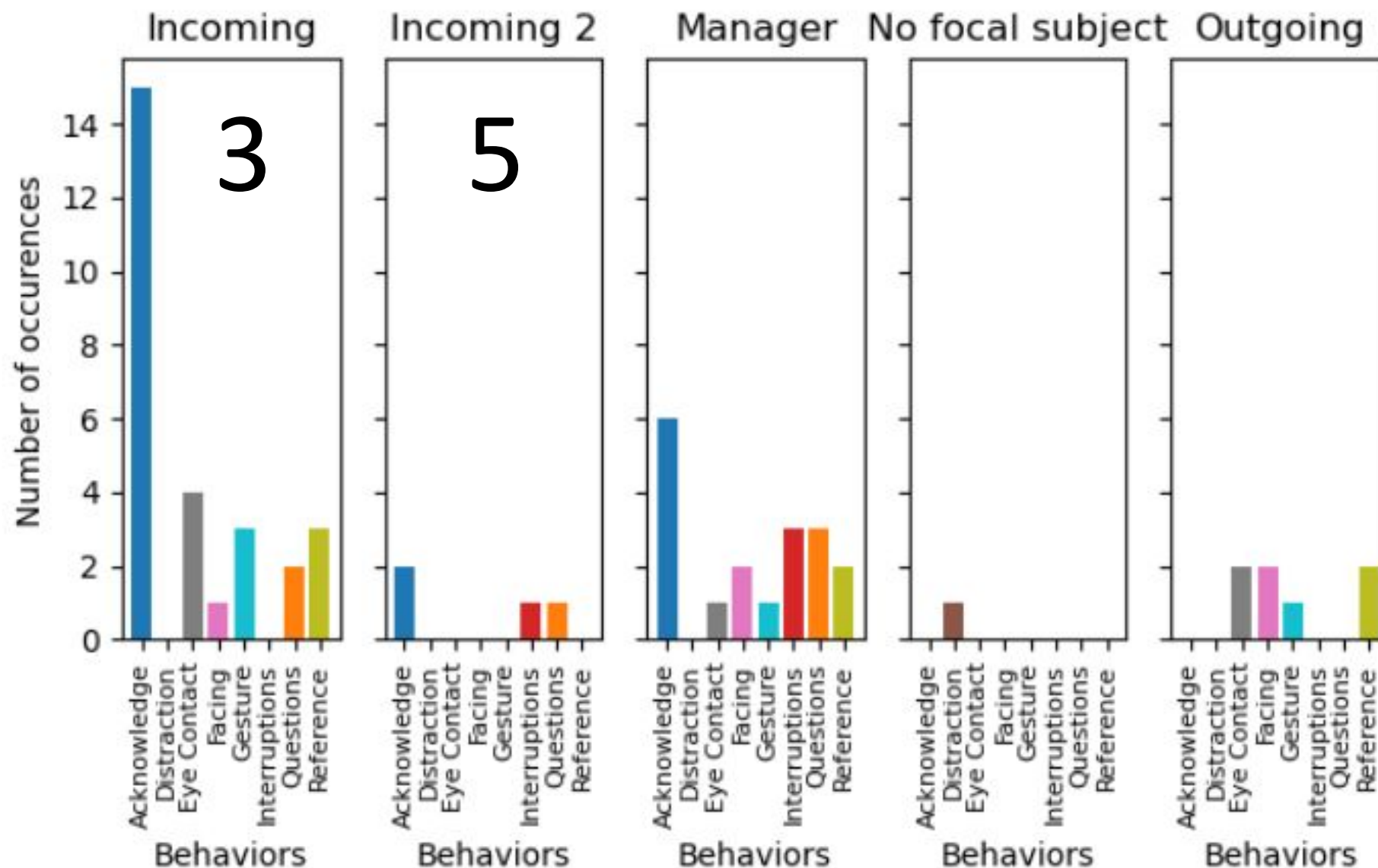
How much will you share with your coworker?



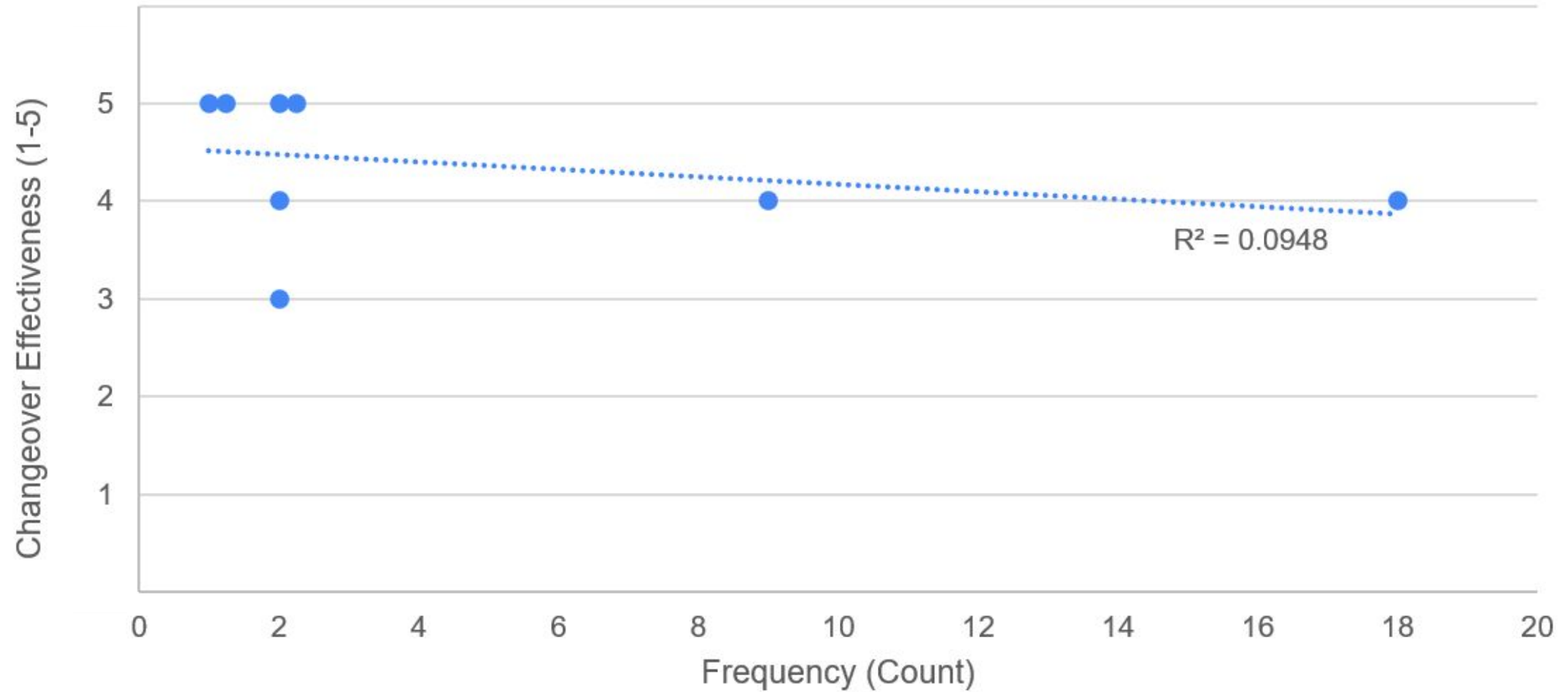
Shift Change #1 - Occurrences



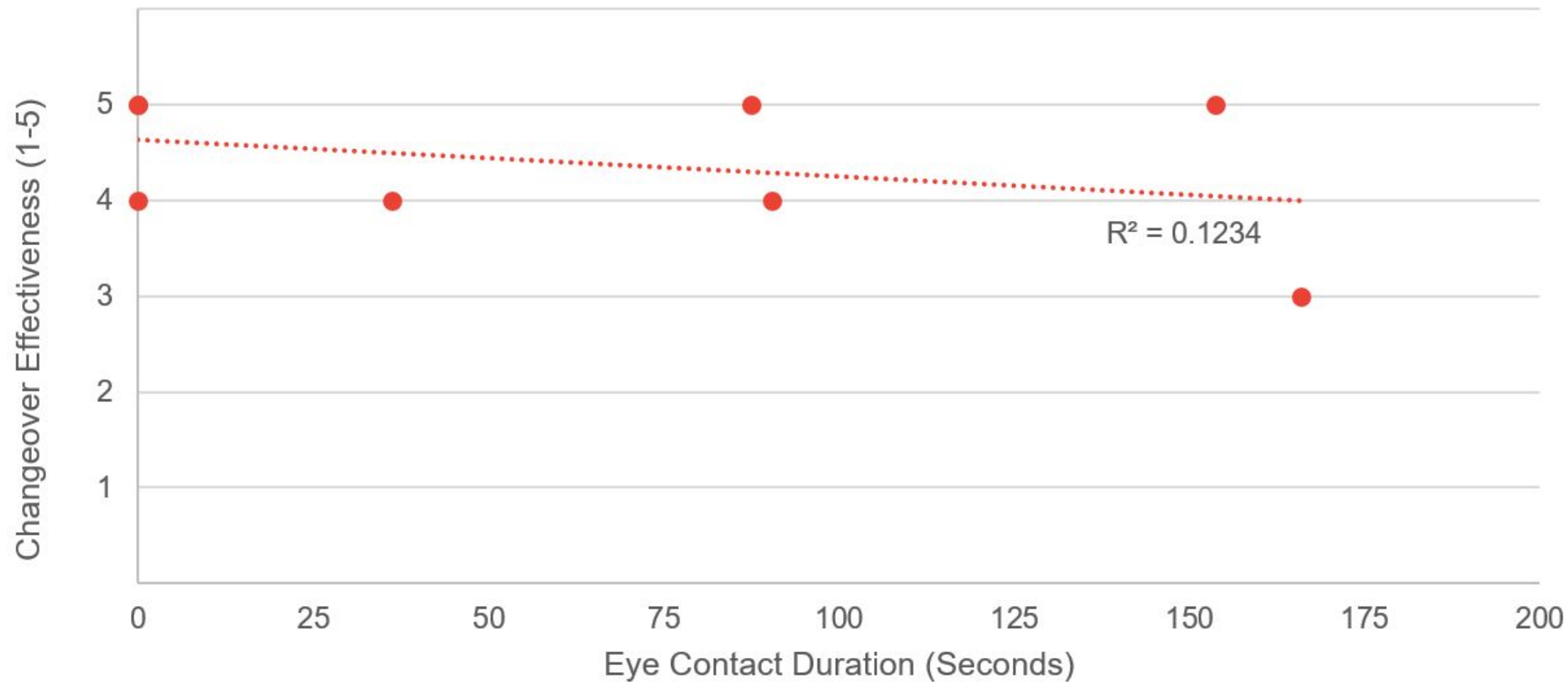
Shift Change #2 - Occurrences



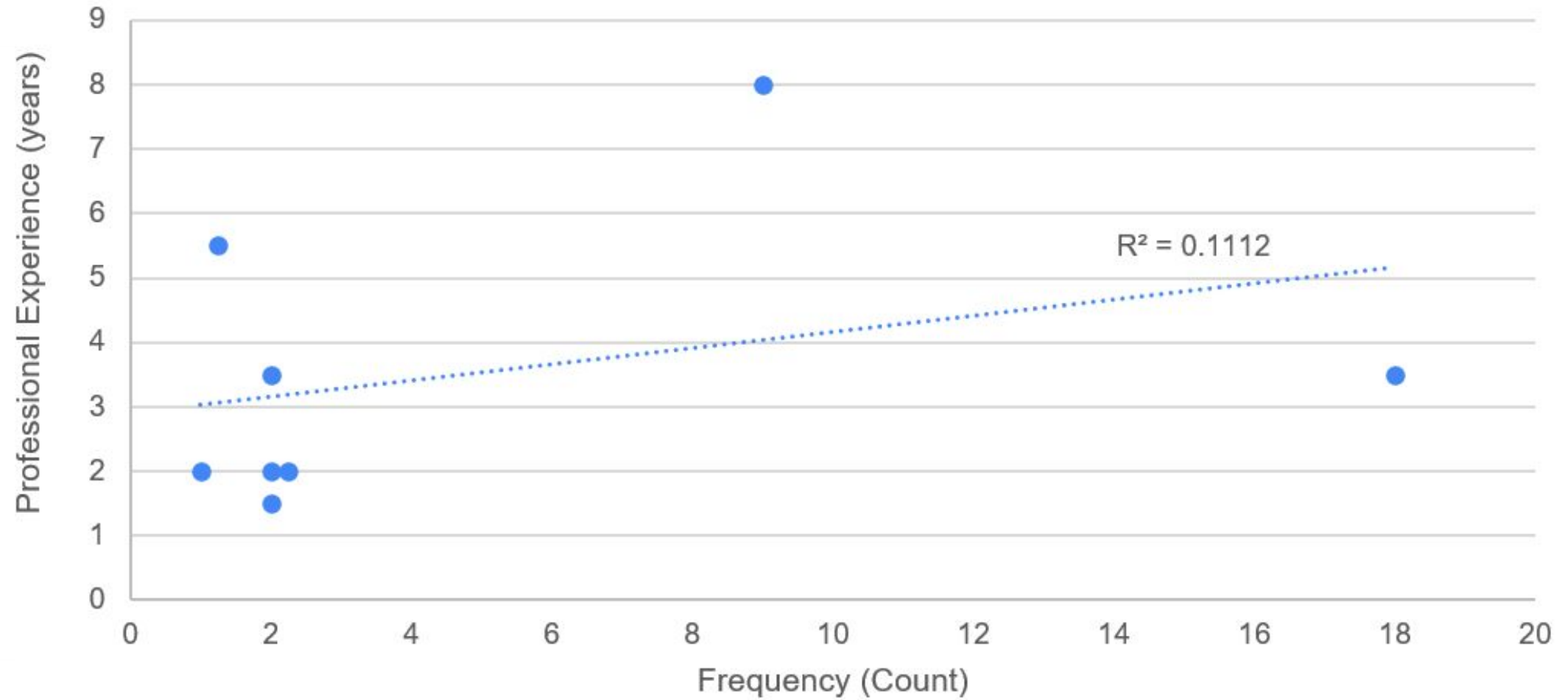
Predicting Effectiveness with Questions



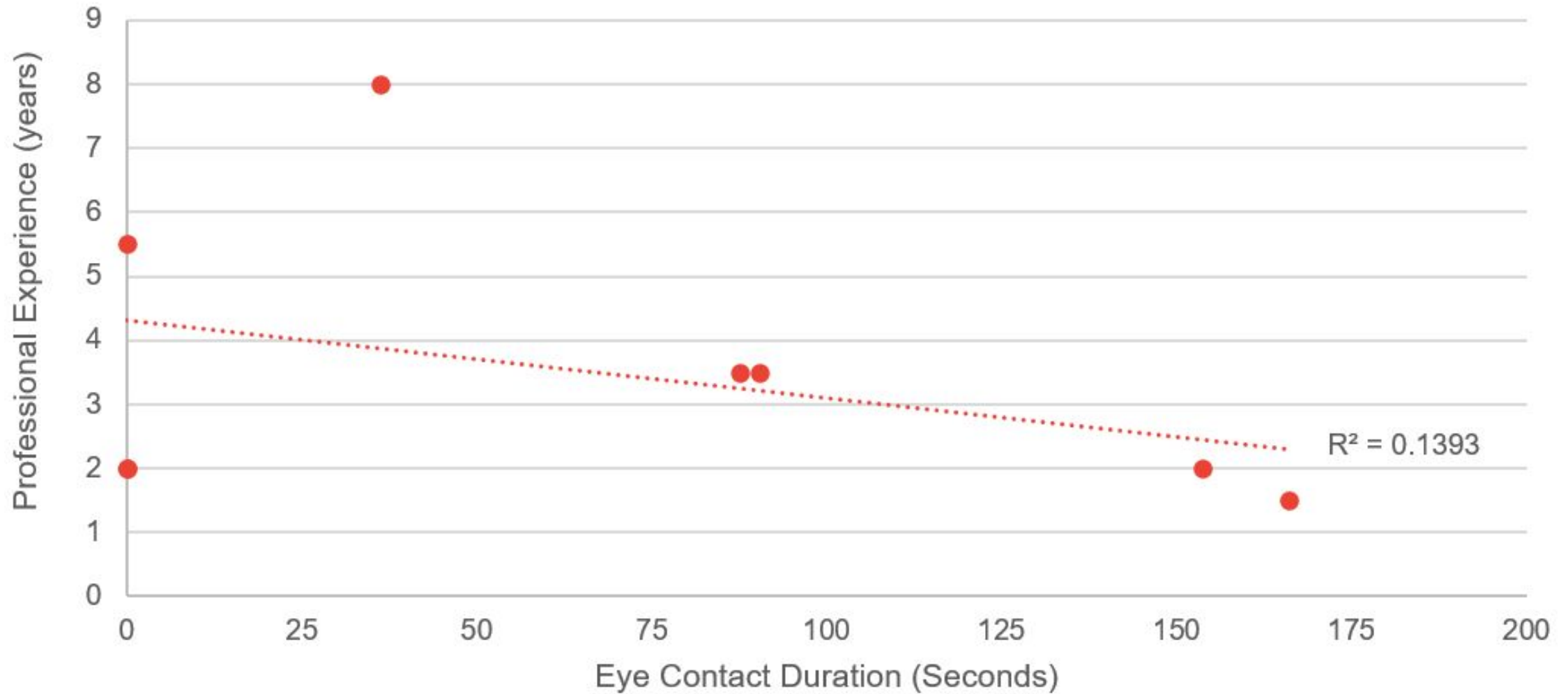
Predicting Effectiveness Using Eye Contact



Predicting Work Experience with Questions



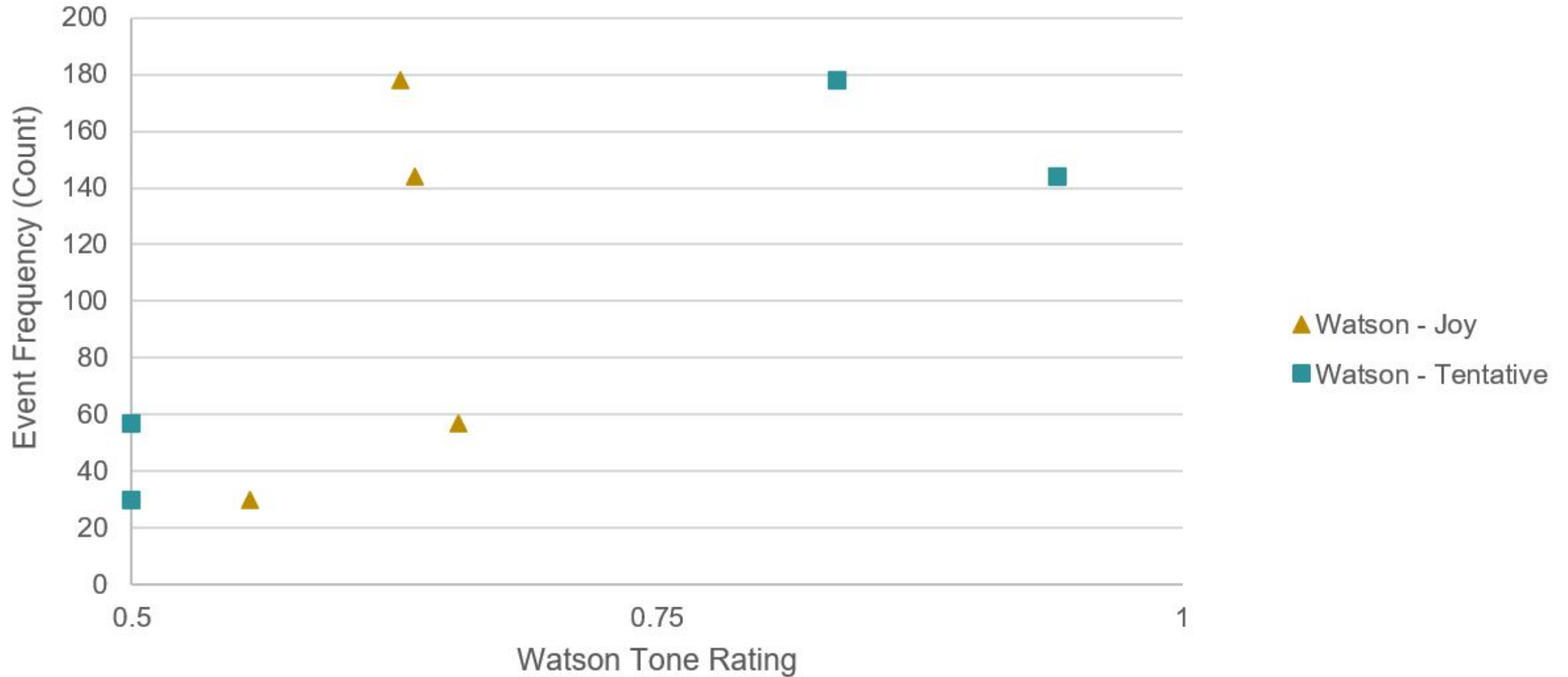
Predicting Work Experience Using Eye Contact



Predicting Effectiveness - Watson Tone Analysis



Predicting Communication - Watson Tone Analysis



Conclusions

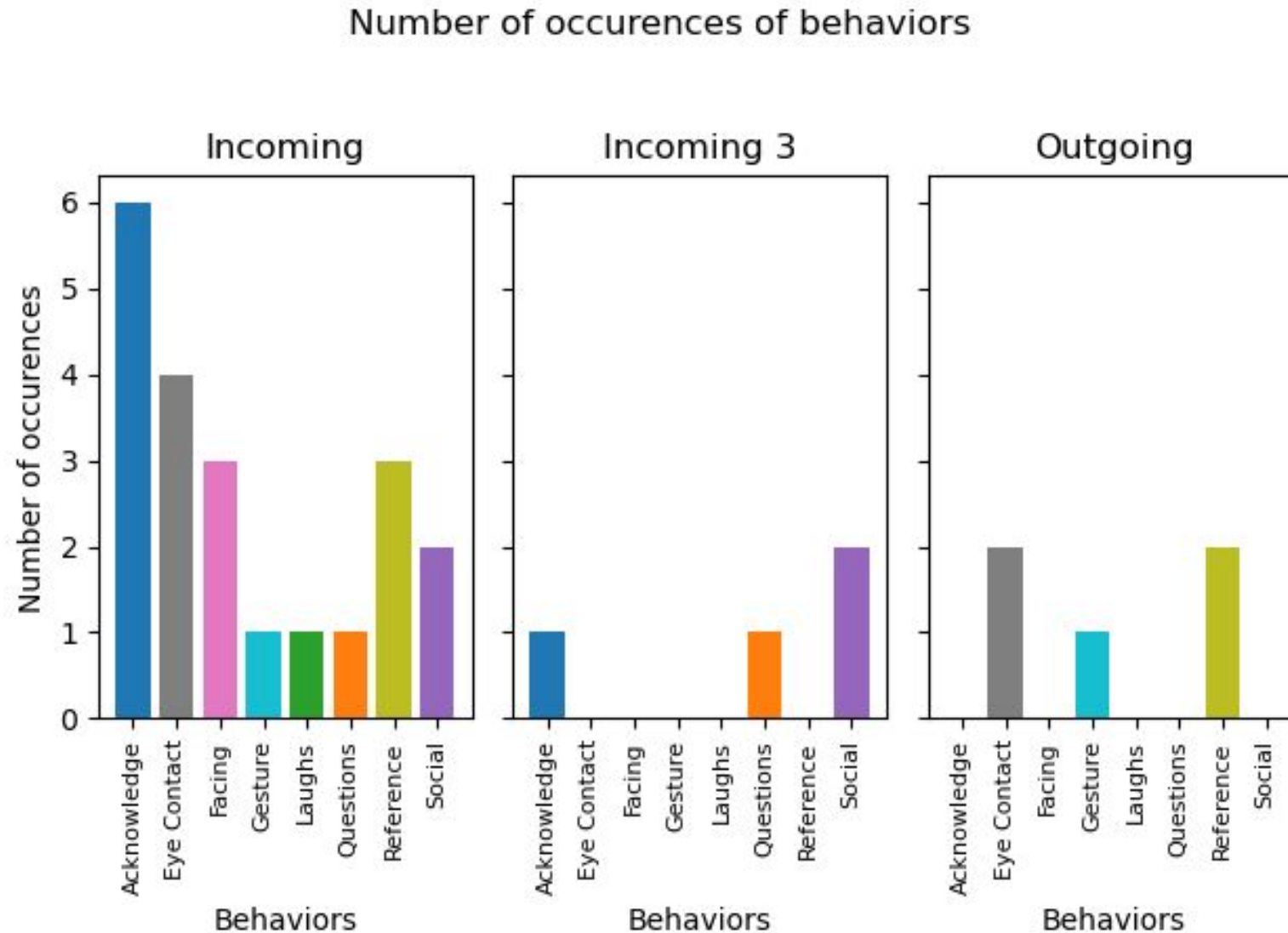
- **Verbal and non-verbal cues** show a weak, but potential inverse relationship with self-reported **effectiveness** of a shift changeover
- **Verbal and non-verbal cues** show a weak, but potential relationship with **level of comfort** between incoming and outgoing shift workers
- Watson detection of **tentative tone** may have potential to predict **volume of communication** between incoming and outgoing shift workers

References

- AM, E., DA, P., & JM, P. (2008). Discourses of anxiety in nursing practice: a psychoanalytic case study of the change-of-shift handover ritual. *Nursing Inquiry*.
- Gonçalves, M. I., Rocha, P. K., Anders, J. C., Kusahara, D. M., & Tomazoni, A. (2016). Communication and patient safety in the change-of-shift nursing report in neonatal intensive care units. *Texto e Contexto Enfermagem*. <https://doi.org/10.1590/0104-07072016002310014>
- Patterson, E. S., Roth, E. M., & Render, M. L. (2005). Handoffs during nursing shift changes in acute care. *Proceedings of the Human Factors and Ergonomics Society*. <https://doi.org/10.1177/154193120504901112>
- Patterson, E. S., Roth, E. M., Woods, D. D., Chow, R., & Gomes, J. O. (2004). Handoff strategies in settings with high consequences for failure: Lessons for health care operations. *International Journal for Quality in Health Care*. <https://doi.org/10.1093/intqhc/mzh026>

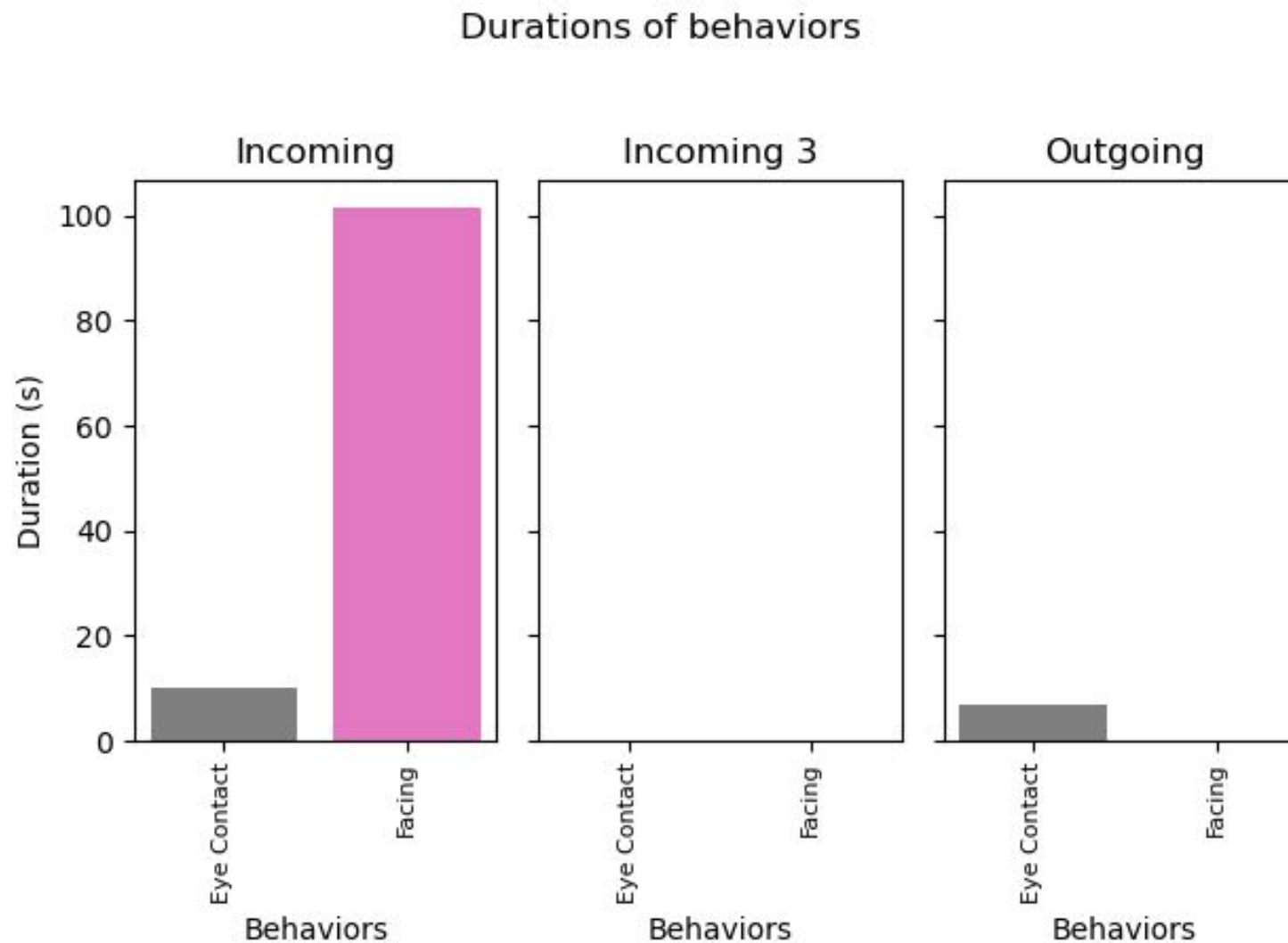
Appendix - Shift Change #3 - Occurrences

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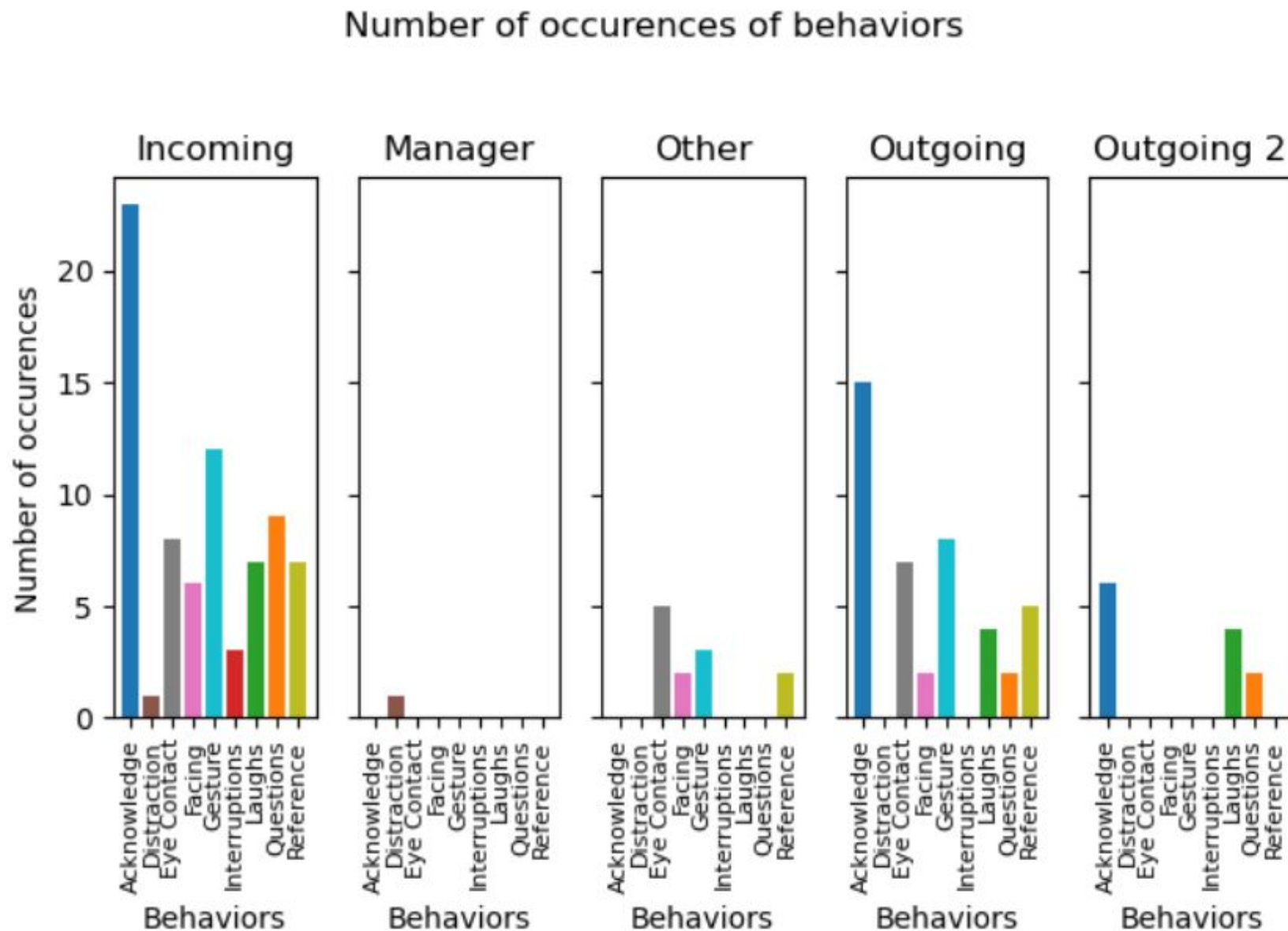
Appendix - Shift Change #3 - Durations

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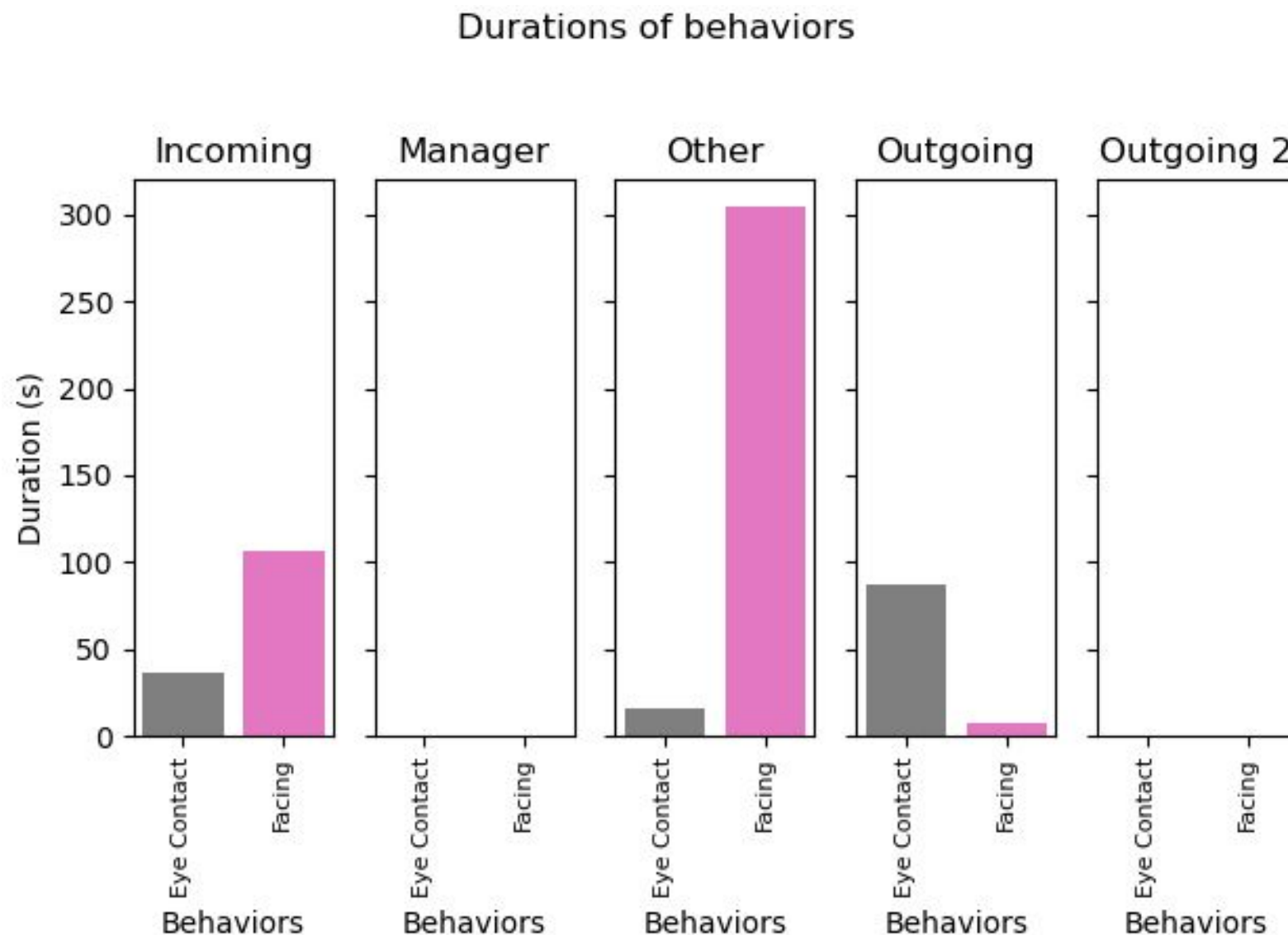
Appendix - Shift Change #4 - Occurrences

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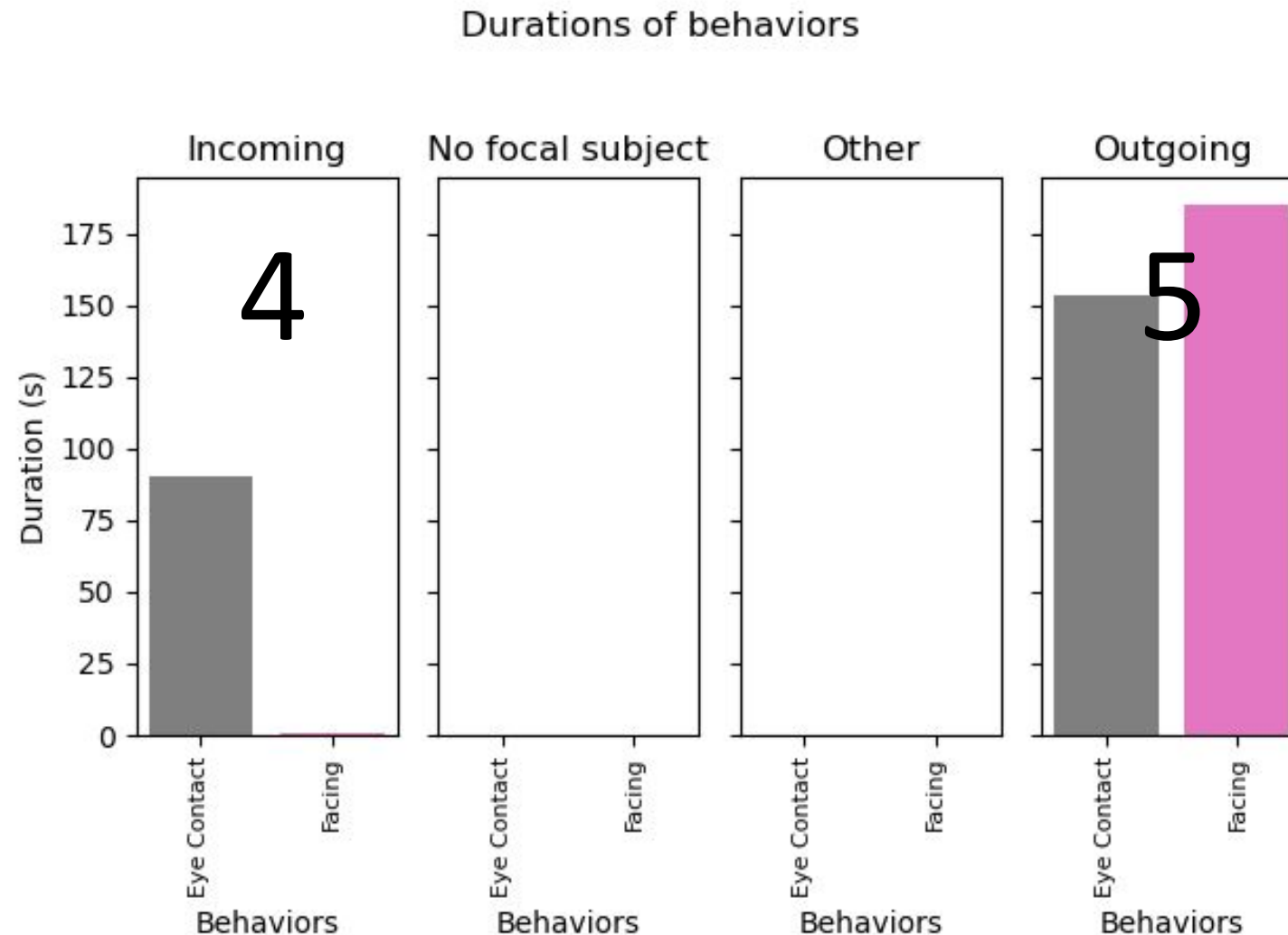
Appendix - Shift Change #4 - Durations

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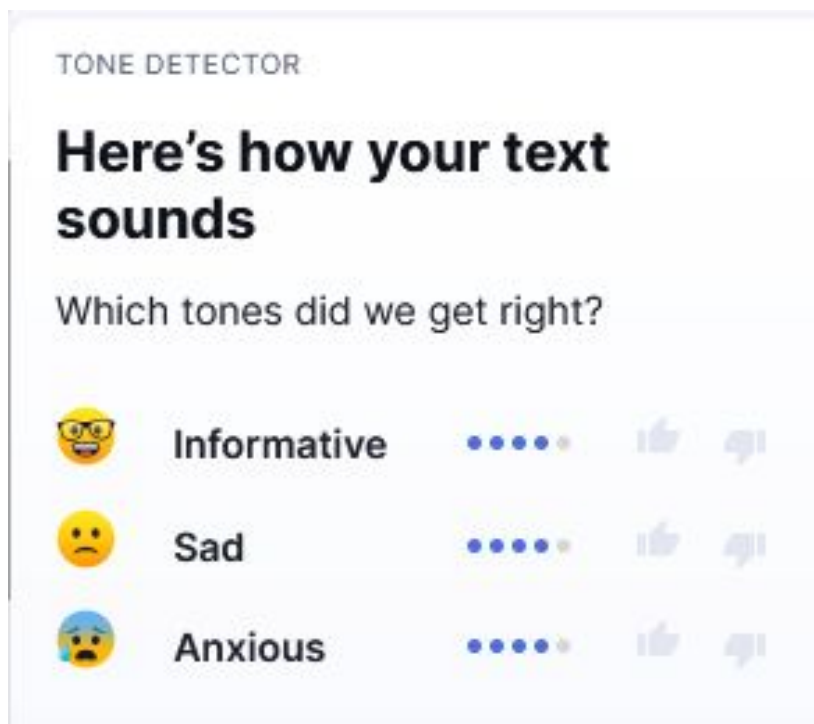
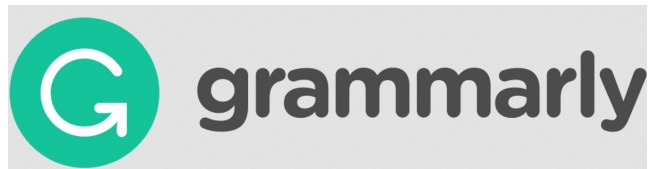
Shift Change #1 - Durations

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Shift Change #1 - Tone

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Joy
0.63

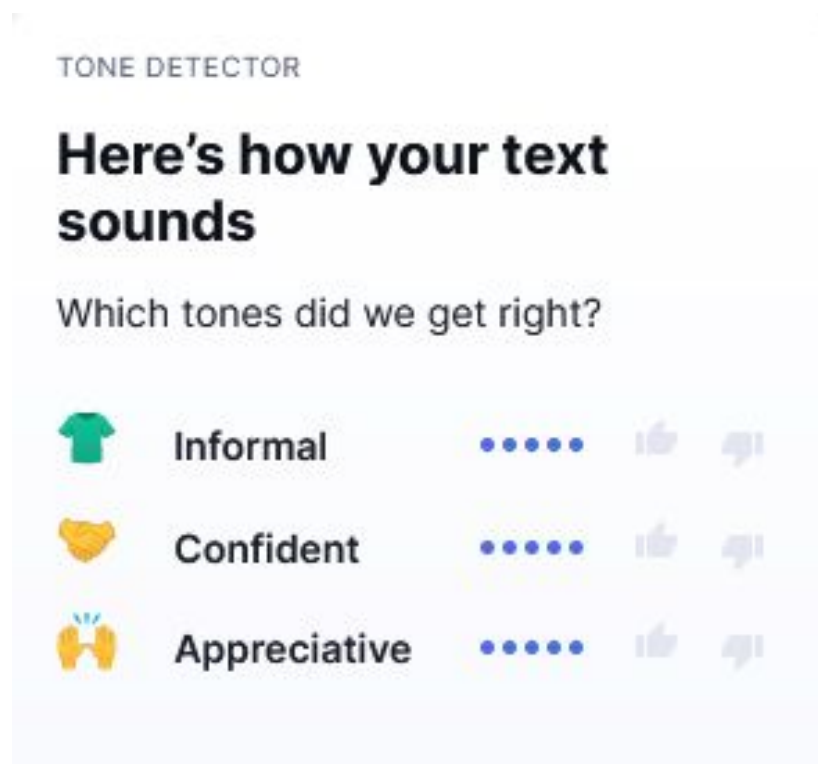
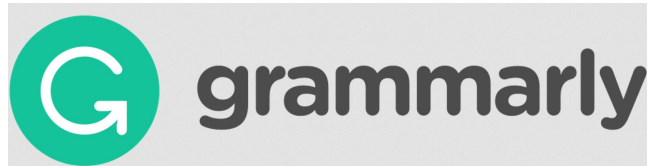
Tentative
0.84

Shift Change #2 - Durations



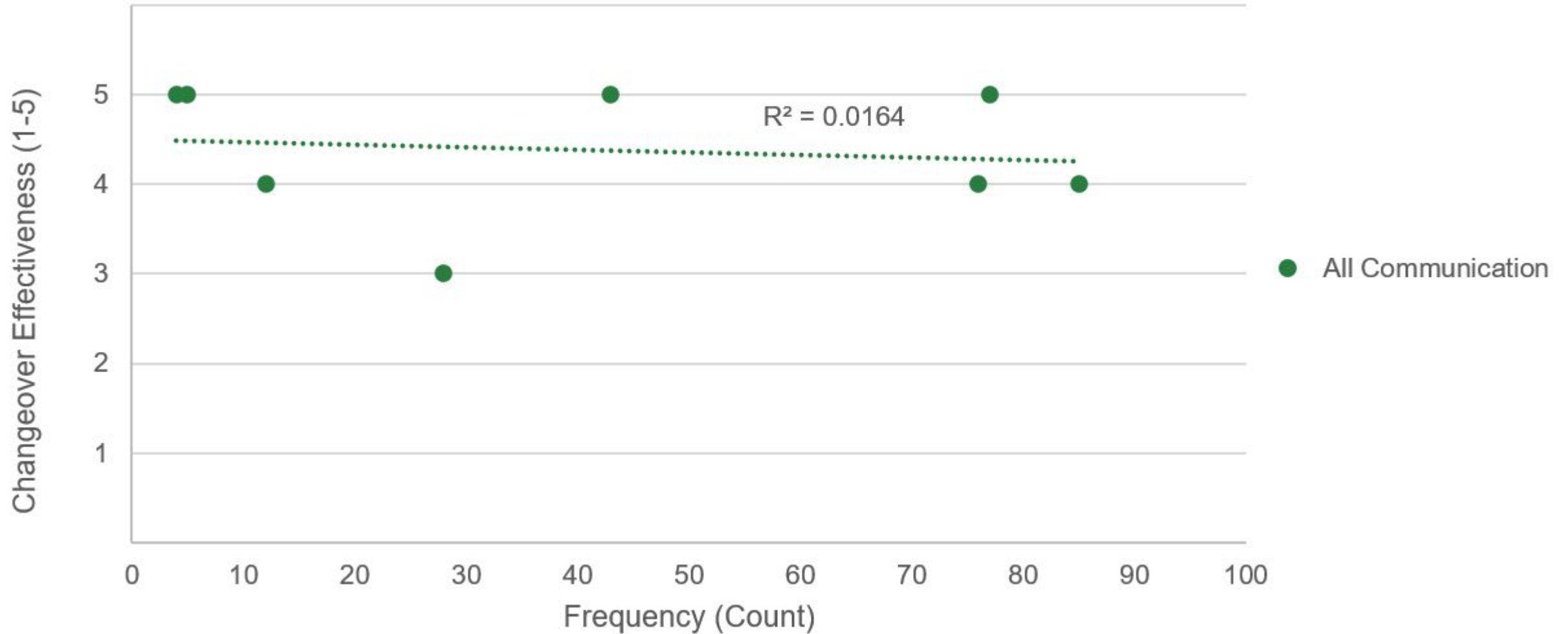
Shift Change #2 - Tone

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Joy
0.66

Predicting Effectiveness - All Communication



Predicting Work Experience - All Communication

