Expanding the Chart to Precision Business, Precision Inners, Precision Military and More

Abigail B. Calkin, PhD

Webinar for

Cambridge Center for Behavioral Studies

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My relationship with Cambridge Center for Behavioral Studies (CCBS)

- History
  - Boston, Cambridge, Framingham Centre, MA &c.
  - Area is a part of me for since the 1600s
  - Began charting in 1967
- Present
  - Late 1990s in touch with Betsy Constantine.
  - A Minute a Day Makes Good Feelings Grow, 2000
  - An advisor on the CCBS Board
- Today
  - Live in Alaska off the road system
  - Write and research

Shell Band Stand on the Esplanade along Charles River, Boston, Mass.

Dept of Justice
Bureau of Justice
Statistics   NO DATA EXCERT CROWD
                                    SOURCING

        DOJ - < 20% of
           police agencies report data
              to DOJ BJS
    FatalEncounters.org

                                    Arrest
    KilledbyPolice.org   Related
                                    Death (ARD)

        Officer related shooting

    Definitions are variable!

Overview

- Precision teaching beginnings
- Inner behavior
- Nursing
- Business
- Military
- Medicine
- Law Enforcement
- Turtle training

Precision Teaching

- Ogden Lindsley spearheaded the development of the standard celeration chart (SCC)
  - Began in 1966 as the standard behavior chart.
  - By 1967, we called the area precision teaching.
  - Its first areas were
    - Special education
    - Management behaviors such as smoking, swearing, etc.
    - Fetal movement
    - Inner behaviors

Elements of the SCC

Frequency, Celeration & Bounce

- The chart depends on frequency.
    - F = C/T

- The analysis of any chart is by its
    - Frequency
    - Celeration
    - Bounce

- We always need all three.

Frequency—1

- **Frequency**
  - **C/T** (Count/Time)
  - **-** Used in all natural sciences
- Pythagoras (6th century BCE) discovered that a perfect octave is the doubling of the frequency.
- Galileo (17th century) discovered the equivalency of different lengths of pendulum swings
- Doppler (19th century) discovered frequency while observing the relationship between a source and an observer when both are in motion.
- Hertz (19th century) one cycle per second of sound

Frequency—2

- Skinner (20th century) one behavior per time unit on cumulative recorder. He termed this rate.

- Lindsley (20th century) one behavior per time unit on standard behavior chart. He called it frequency.

  - Cannot efficiently use the cumulative recorder in the classroom, but

  - Can efficiently use the paper chart in the classroom.

Celeration (Growth or Decay)

- **Celeration = Count/Time/Time (C/T/T)**
- Measures growth or decay across time
  - Count per day per week
  - Count per week per month
  - Count per month per half year
  - Count per year per half decade

Bounce (Variability)

- Two ways to describe bounce
  - Standard deviation
  - Ratio
    - Envelopes
    - Change by multiply (x) or divide (÷)

IS DOES/DID EQUATION

Hypothetical Behavioral Equation (what might be)

P	PE	MC	A	AE
Program	Program	Movement	Arrangement	Arranged
	Event	Cycle		Event

Behavioral Equation (what the data say does/did occur)

D	S	R	K	C
Disposition	Stimulus	Response	Contingency	Consequence

Cast in order of appearance—1

- Precision…
- …Teaching
  - 1966
  - Lindsley, Koenig, Duncan, Haughton
- …Inners
  - 1966-1971 & following
  - Lindsley, Duncan, Haughton, Dean, Calkin
- …Therapy
  - late 1960s
  - Duncan, Holschuh

Cast in order of appearance—2

- …Nursing
  - 1970-75
  - Dean
- …Social Work
  - 1972
  - Judy Copp Green—NASW
- …Megadata sets
  - 1970s
  - social, national, international & planetary
  - Lindsley, Hughes, Hively, Graf, Neely, Eshleman

Cast in order of appearance—3

- …Business—1980s
  - Binder
  - Chart-based learning centers
- …Rehabilitation—1980s
  - C. Merbitz, N.H. Merbitz
- …Military—2012
  - Corso, Calkin, Xcelerate Innovations (Corso, Meador, Kondis, Calkin) (2014)
  - Emily Leeming (2019)

Cast in order of Appearance—4

- …Medical—fetal, epilepsy, cancer, dying,
  - Early 60s to present & future
  - Edwards, Casson, Neely, Cornelius, Calkin
- Law Enforcement
  - 2015
  - Wiech
- …Neptune, the turtle
  - latency

Precision Inners (1)

- Ogden's cigarette smoking and urges (1966)
- Early students
- Anne Duncan's sexual urges
- Diana Dean's dissertation
  - Nursing
  - Every student counted + and – feelings in their different placements, e.g., pediatrics, geriatrics, to determine what area they wanted to work in.

Precision Inners (2)
Lindsley's 1969 list of pinpoints

Counted	Date	Who	What
Urges	31 July 1966	Lindsley	Reaches➔ Urges
	18 Sept 1966	Holzschuh	
Thoughts	28 April 1967	Koenig	"Judy thoughts"
Inner Life	10 April 1968	Edwards	Fetal movements
	2 July 1968	Burkus	"
	3 July 1968	R. Harris	"
	30 OCT 1968	Holzschuh	"
Symptoms	30 Nov 1969	Walker	Hate feelings

Precision Inners (3)

- Calkin and the 1-min timing (1977)
  - This expanded without her knowledge.
- Calkin dissertation on facts, fun & freedom (1979)
- Research projects on inner behavior.
  - Thoughts
  - Feelings
  - Urges

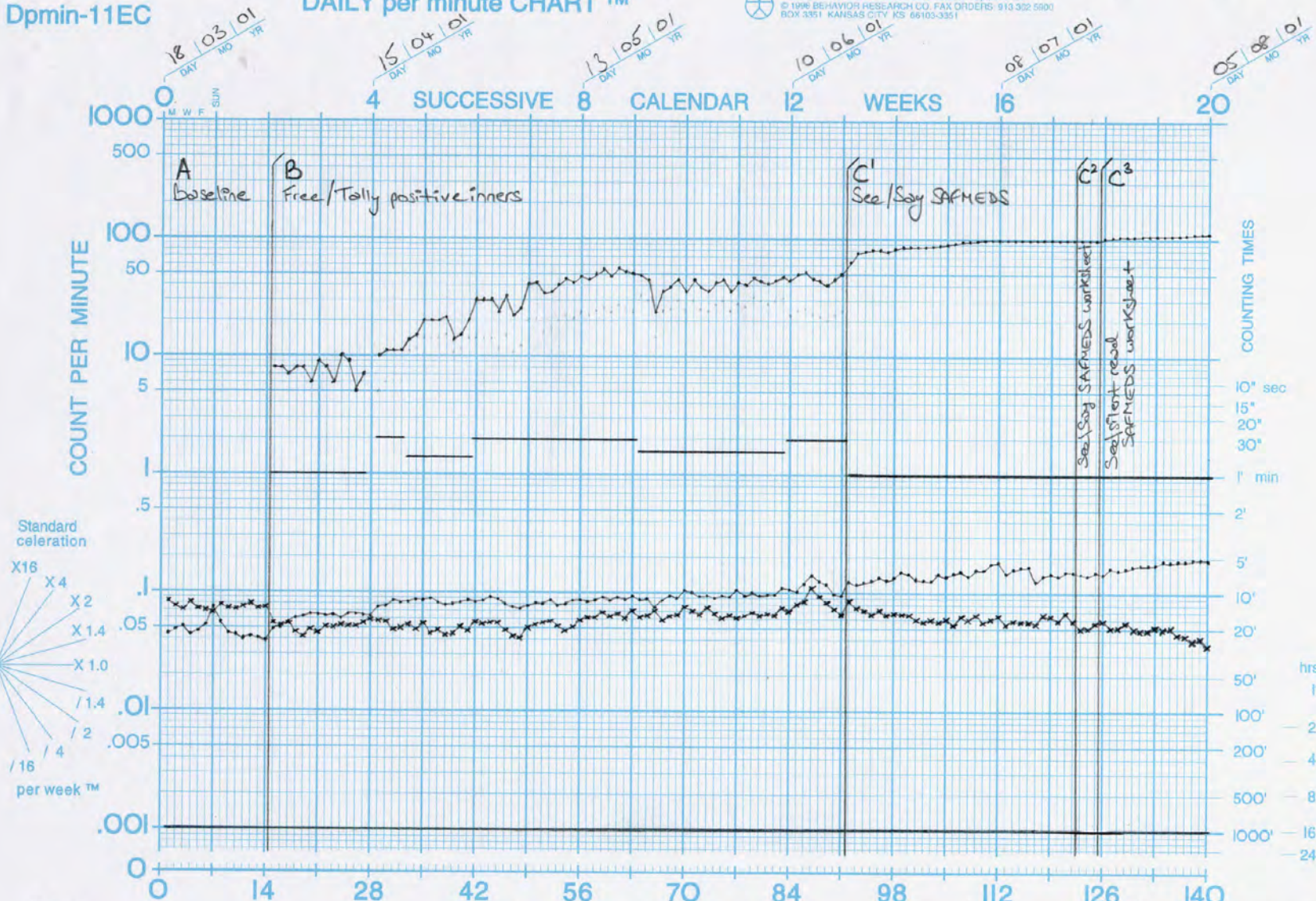# Table 1. Inner Behavior Research Projects.

Researcher	Date	Total Charts	Total People
Kandel	1971	12	12
Behavior Bank	1971, 1974	219*	unknown
Sokolove	1973	281**	281***
Dean	1973	312**	34
Calkin	1979	161	105
Calkin	1992	35	35
Kubina	1994	2	2
Kostewicz	2000	2	1
Clore	2006	0	10
Cobane	2006	27	22
Patterson	2008	6	9
Rich	2009	3	3
Total		**1,060**	**514**

- Inner behavior charts in the Behavior Bank in addition to those Sokolove and Dean deposited.
** Sokolove's and Dean's studies separated the positive and negative behaviors, whereas the others usually combined the acceleration, deceleration, and the 1-min timings on the same chart.
*** Caveat: Sokolove lists hers as phases, so it is unclear if these are all individual people.

Standard Celeration Chart (Dpmin-11EC) — DAILY per minute CHART™ for performer 'Kathy', charting POSITIVE + NEGATIVE counted INNERS. Phases: A baseline, B Free/Tally positive inners, C¹ See/Say SAFMEDS, C² See/Say SAFMEDS worksheet, C³ See/Start recall SAFMEDS worksheet. Chart 1.
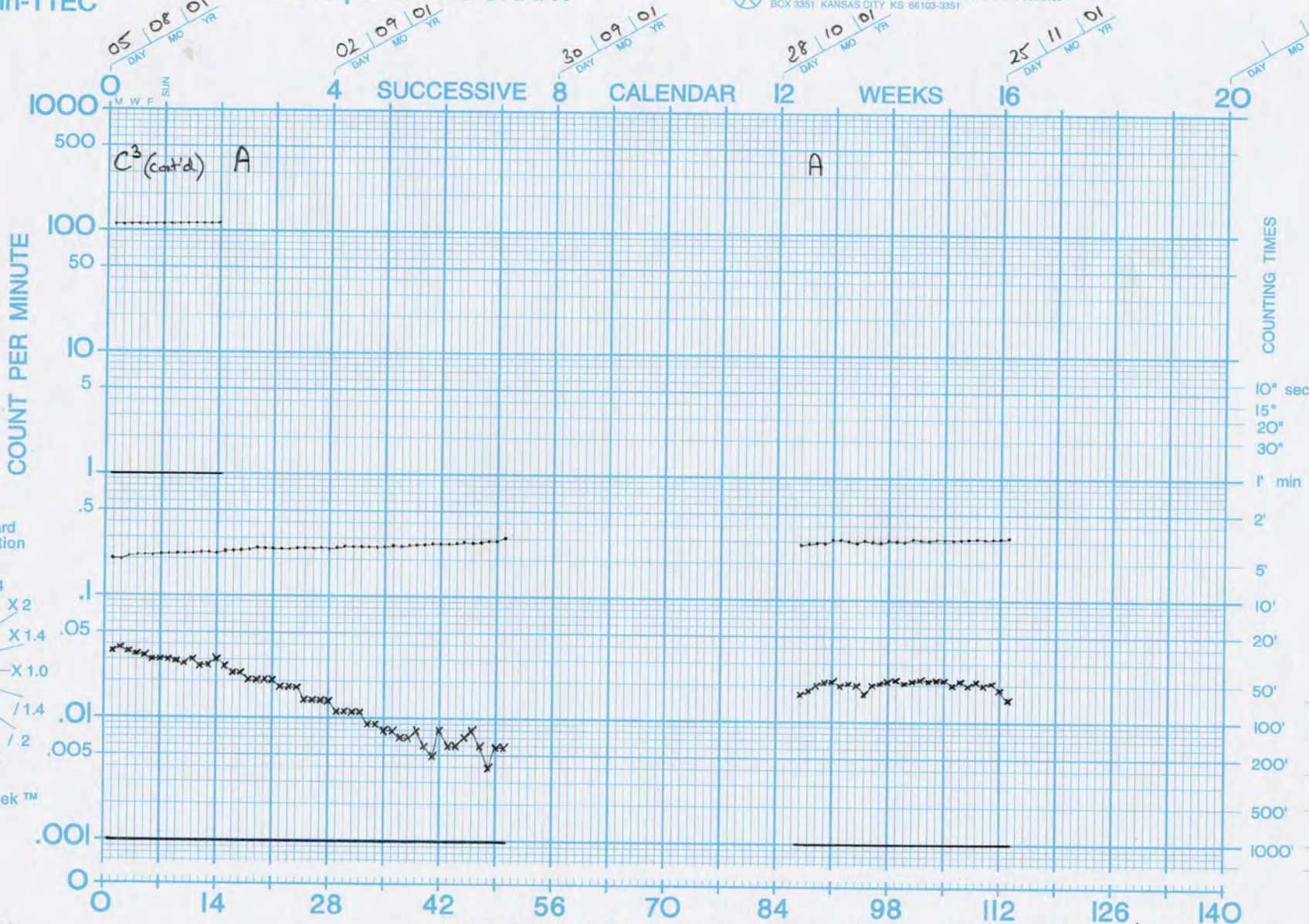
Precision Nursing

- Nursing Department
  - Mt. Hood Community College
  - Head—Diana Dean
  - All curricula and practica learning was chart-based.
  - Entire program is in the Behavior Research Company's Behavior Bank
    - Total deposited projects across all behaviors, 32,000+
    - Total analyzed projects across all behaviors, 16.000+

| MOVEMENT CYCLE	A	C	D	MOVEMENT CYCLE	A	C	D
FEELS NEG ABT MARGIE	0	0	1	FEELS POS ABT NURSING 101	1	0	0
FEELS NEG ABT MED SCH NSG PRGM	0	1	0	FEELS POS ABT NURSING 106	1	0	0
FEELS NEG ABT MHCC PROGRAM	0	2	28	FEELS POS ABT OTHER HOSP PERSN	1	0	0
FEELS NEG ABT NURSING PROFESON	0	2	24	FEELS POS ABT PATIENT	23	2	0
FEELS NEG ABT NURSING PROGRAM	0	0	2	FEELS POS ABT PEER	26	1	0
FEELS NEG ABT NURSING STUDENT	0	0	1	FEELS PREJUDICE	0	0	1
FEELS NEG ABT NURSING 101	0	0	1	FEELS PREPARED FOR CLASS	1	0	0
FEELS NEG ABT NURSING 106	0	0	1	FEELS TIRED	0	0	1
FEELS NEG ABT OTHER HOSP PERSN	0	0	1	FEELS UNHAPPY	0	0	1
FEELS NEG ABT PATIENT	0	4	19	FEELS UNPREPARED FOR CLASS	0	0	1
FEELS NEG ABT PEER	0	2	25	FEELS VIGOUROUS	1	0	0
FEELS NEG ABT STUDENT A	0	0	1	FELLS NEG ABT MALE NURSES	0	1	0
FEELS NEG ABT STUDENT B	0	0	1	FORGETS CLEOCIN MED (LIQUID)	0	0	1
FEELS POS ABT ADMIN PROGRAM	1	0	0	IGNORES OTHER	0	1	0
FEELS POS ABT BEARD	1	0	0	INTERACTS NEGATIVELY	0	1	30
FEELS POS ABT BI 231	1	0	0	INTERACTS POSITIVELY	31	0	0
FEELS POS ABT CLASS	1	0	0	INTERRUPTS CONVERSATION	0	0	1
FEELS POS ABT CLASS PRESNTATON	4	0	0	INVITES STUDENT FEEDBACK	3	0	0
FEELS POS ABT COLLEGE	1	0	0	LOOKS AT FACULTY CHART	1	0	0
FEELS POS ABT ENVIRONMENT	1	0	0	LOOKS AT STUDENT CHART	1	0	0
FEELS POS ABT FACULTY	1	0	0	MAKES SELF UNAVLABL TO STUDENT	0	0	1
FEELS POS ABT GA NURSING HOME	1	0	0	MEETS NEW MHCC FACULTY STAFF	1	0	0
FEELS POS ABT GROUP PROCESS	1	0	0	NOTES GOOD POSTURE	3	0	0
FEELS POS ABT INSTRUCTOR	2	0	0	NOTES POOR POSTURE	0	0	4
FEELS POS ABT MALE NURSES	1	0	0	PERSONALIZES PATIENT CARE	24	1	0
FEELS POS ABT MARGIE	1	0	0	PERSONALIZES TEACHING	1	0	0
FEELS POS ABT MHCC PROGRAM	29	1	0	PICKS FACE	0	0	1
FEELS POS ABT NURSING PROFESON	24	2	0	PLACES PHONE CALL	0	1	0
FEELS POS ABT NURSING PROGRAM	2	0	0	POUTS	0	0	1
FEELS POS ABT NURSING STUDENT	1	0	0	REACTS NEG TO SHORT TERM OBJ	0	0	1

FIRST PHASE   BEST PHASE   BEST MULTIPLIERS
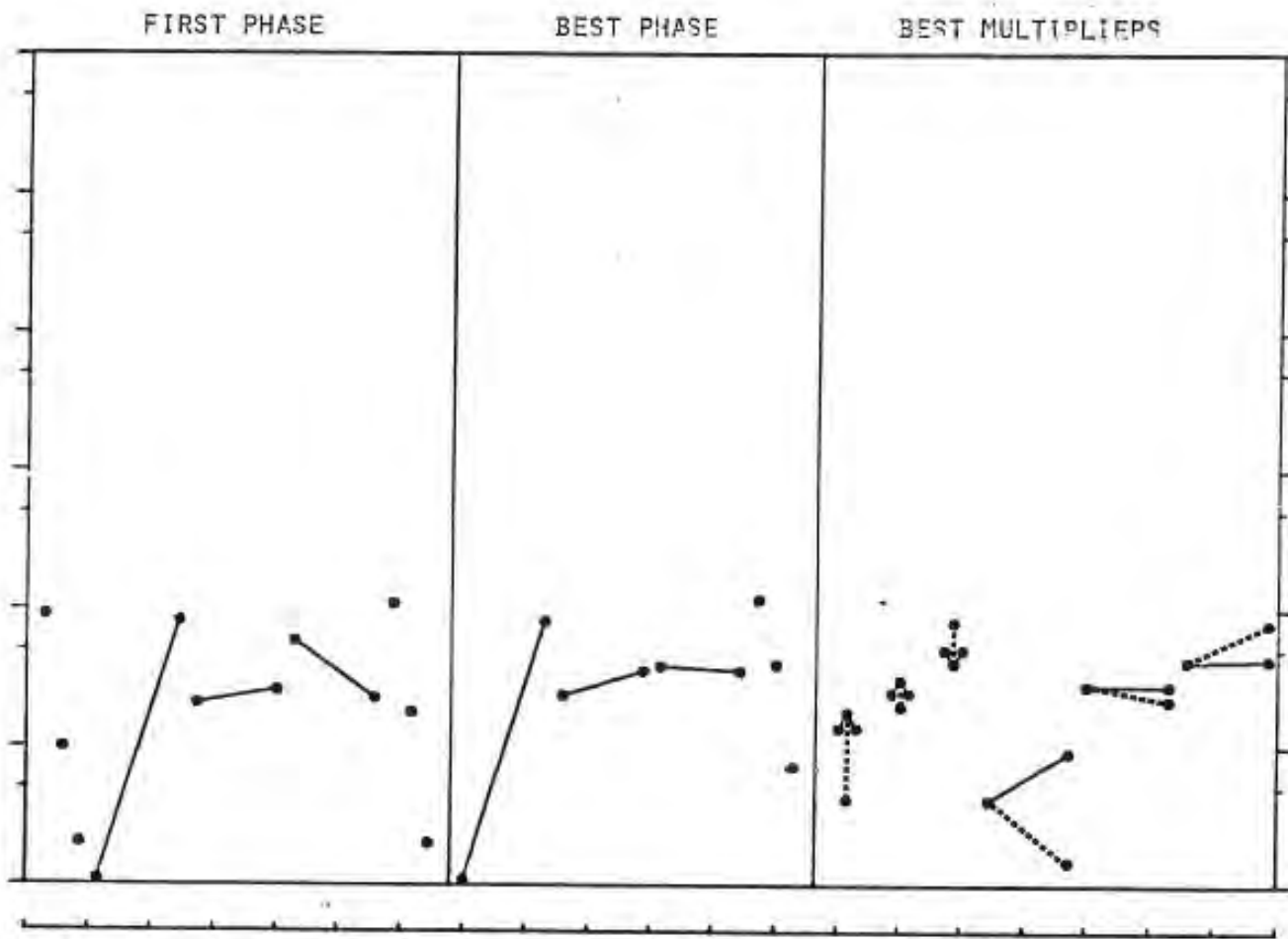
BHVR BANK   BOX 3113 KCKS 66103   31 BHAVERS   INTERACTS POSI
                                     ACC   TIVELY

Social Work

- Judy Copp Green
  - late 60s
  - Daily Chart--DC 8
- Pinpoints
  - Wets clothes
  - Self care skills
  - Inner behaviors
  - Interview behaviors
  - Communication with staff

Jay

- "a twenty-year-old spastic, retarded man"
- Urinates in clothes
- No organic reason
- Urinated in his clothes twice in 840 min awake
- 2 punishment phases that didn't work
  - Left wet for 30 min
  - Left in room for rest of day
- Rewarded with candy and praise when used toilet
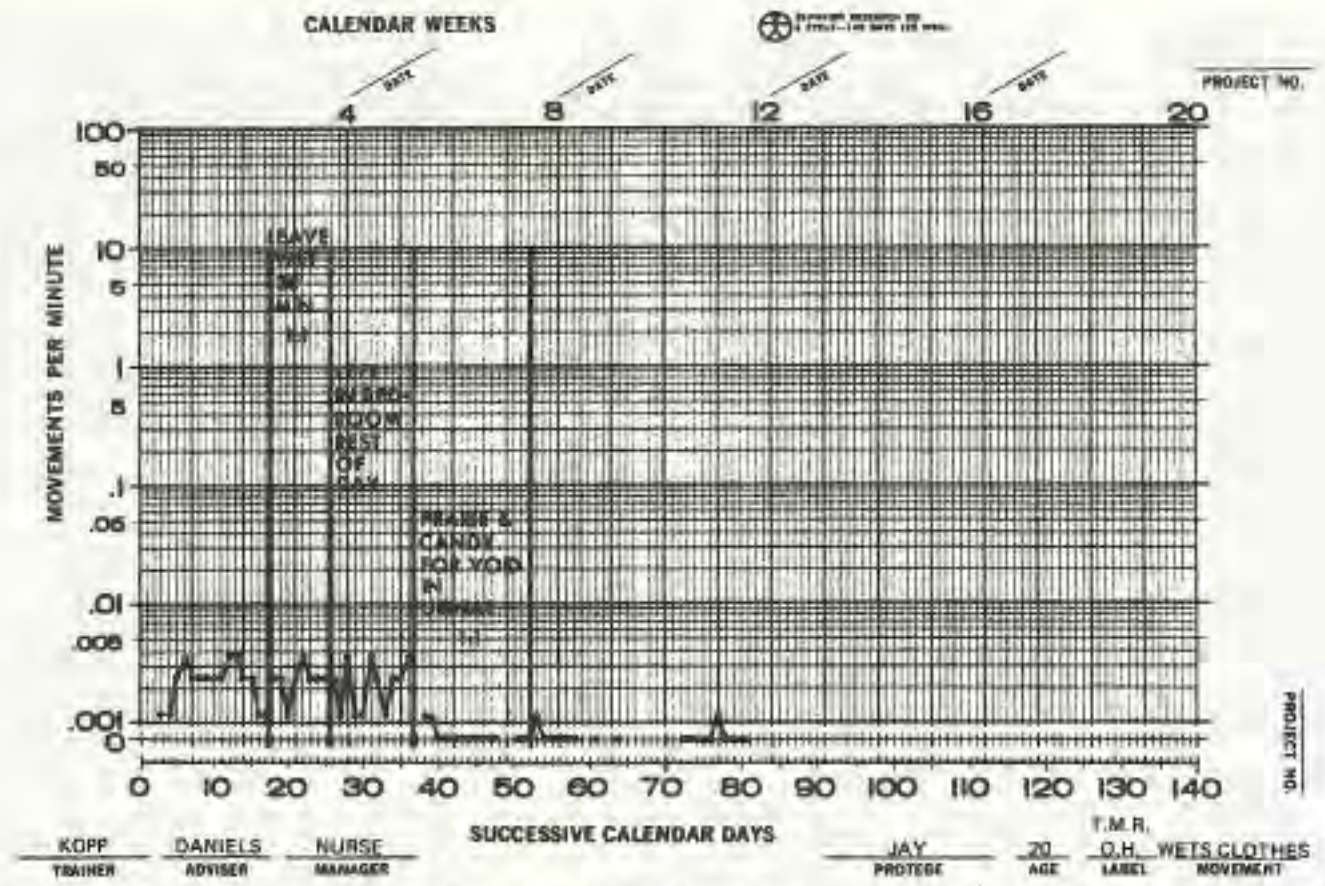
FIGURE 4.1   Nursing home patient's rate of wetting clothes; before phase; two phases using punishment procedures; fourth phase using reward of incompatible desired behavior; and an after phase (same conditions as before phase).

Megadata Sets

- Graf—Lone Ranger, Aumon, Neely, Eshleman—auroras, historical scientific data ("Secret Celeration Society")

- Lindsley (historical US), Hughes (historical sociological)

- Calkin (national budget), Kielbasa (GDP & debt)

- **Hively**
  - **Through the Lens of the Standard Celeration Chart: Population, Water, and Oil**

1925   1975   2025

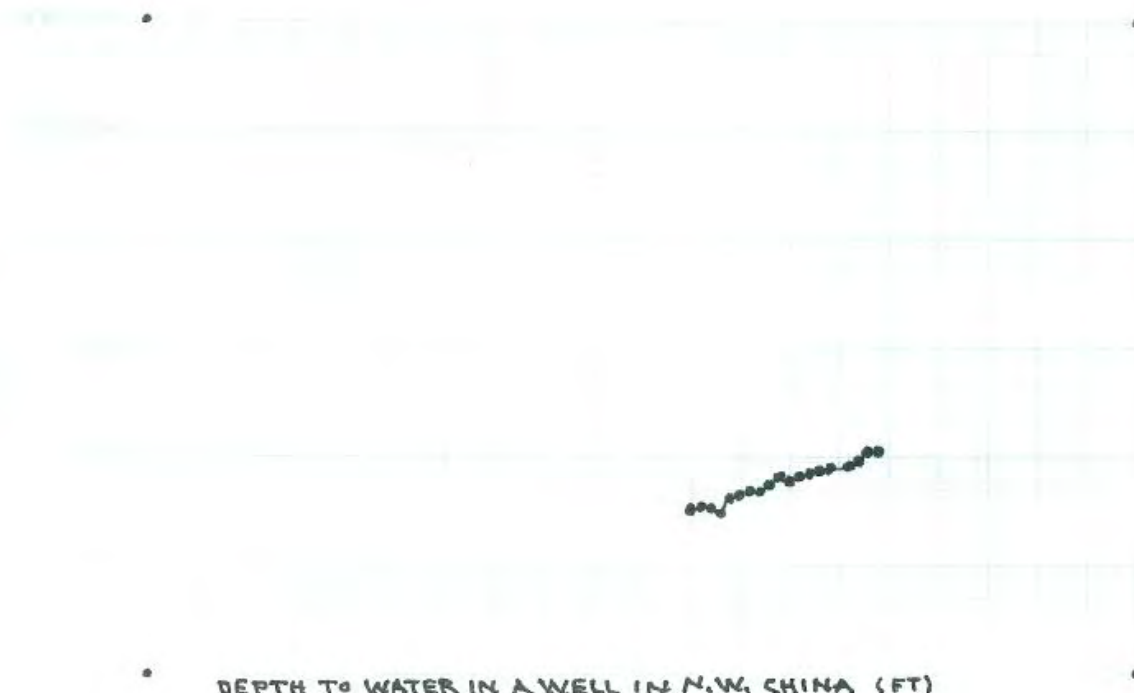CALIFORNIA WATER WITHDRAWALS (B/gal./Day)

SOURCE: USGS

KANSAS GEOLOGICAL SURVEY

DEPTH TO WATER IN A WELL IN S.W. KANSAS (FT)

DEPTH TO WATER IN A WELL IN N.W. CHINA (FT)

FAOSTAT 2000

WORLD IRRIGATED AREA (HECTARES × 10^3)

Precision Business

- Carl Binder
- Chart-based learning centers & schools

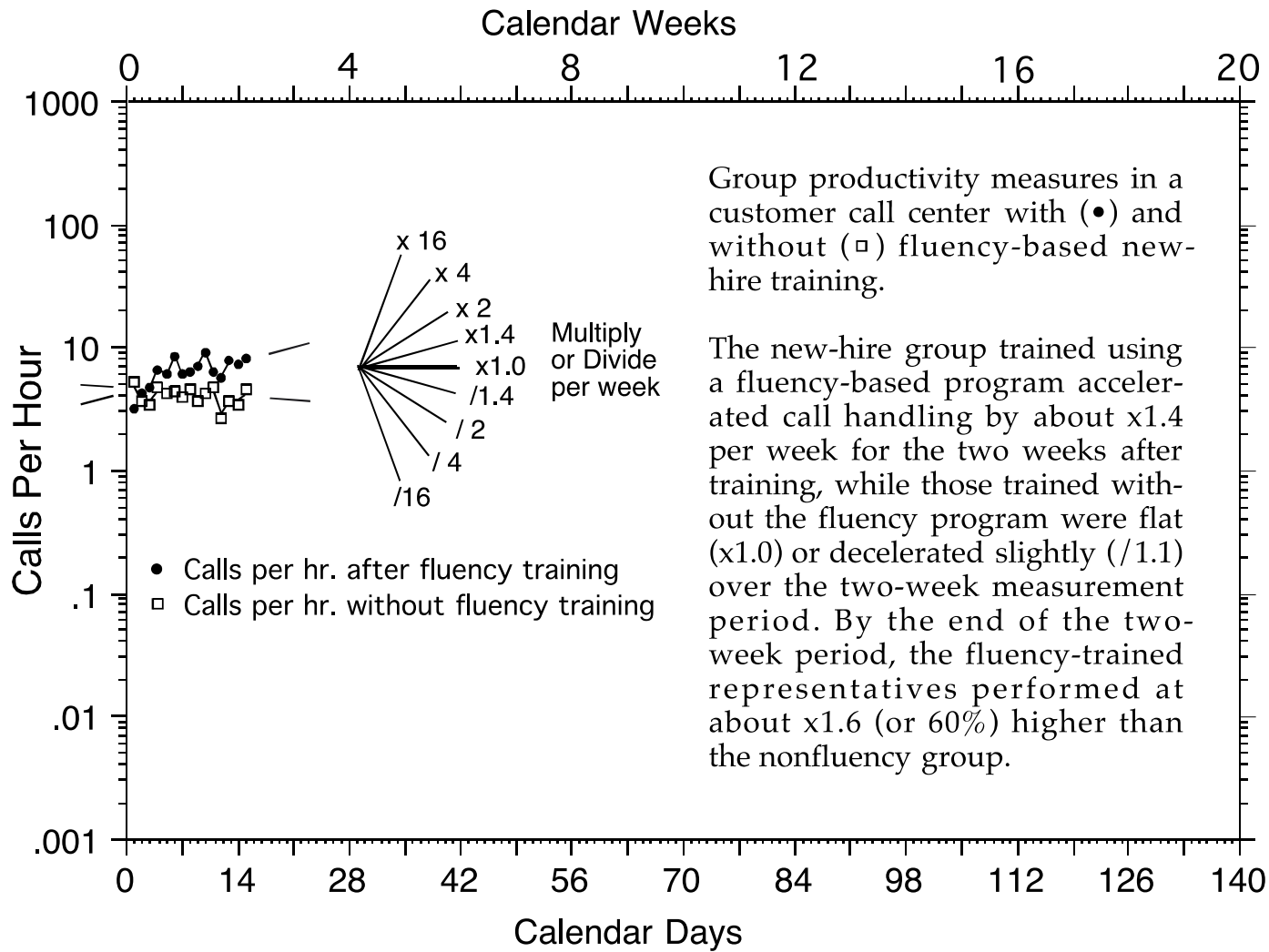**Calendar Weeks**

Group productivity measures in a customer call center with (•) and without (▫) fluency-based new-hire training.

The new-hire group trained using a fluency-based program acceler-ated call handling by about x1.4 per week for the two weeks after training, while those trained with-out the fluency program were flat (x1.0) or decelerated slightly (/1.1) over the two-week measurement period. By the end of the two-week period, the fluency-trained representatives performed at about x1.6 (or 60%) higher than the nonfluency group.

x 16
x 4
x 2
x1.4
x1.0   Multiply
/1.4   or Divide
/ 2   per week
/ 4
/16

• Calls per hr. after fluency training
▫ Calls per hr. without fluency training

Calls Per Hour

Calendar Days

Figure 6. Average Call-Handling Productivity

Rehabilitation

- Chuck Merbitz, then Chuck and Nancy
- Chuck began this work in the 1980s
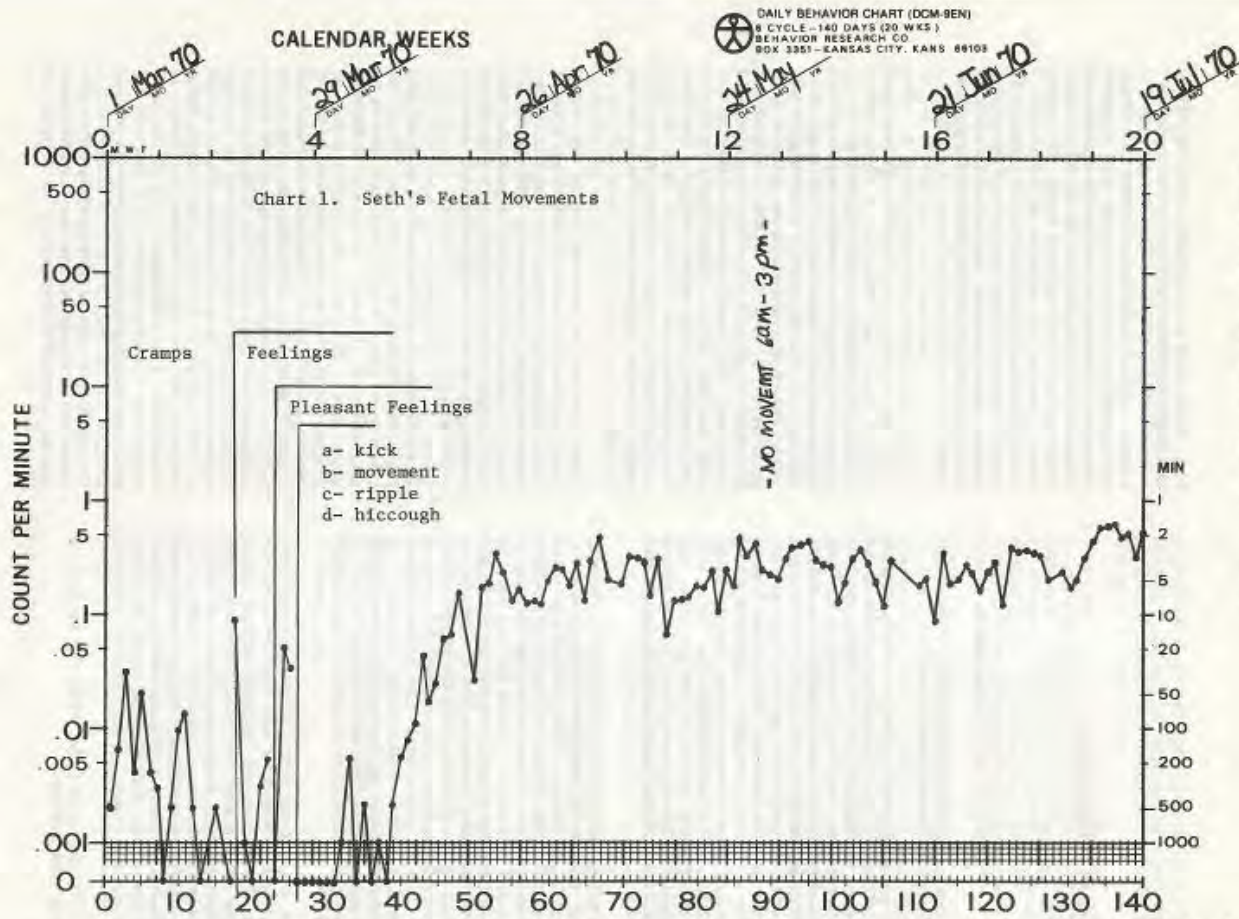- Chuck and Nancy continued into the 2010+

FIGURE 2
Sara's Chart.

Name of Behaver: Sara   Movement Cycle: Home & Class Med Aspects SAFMEDS
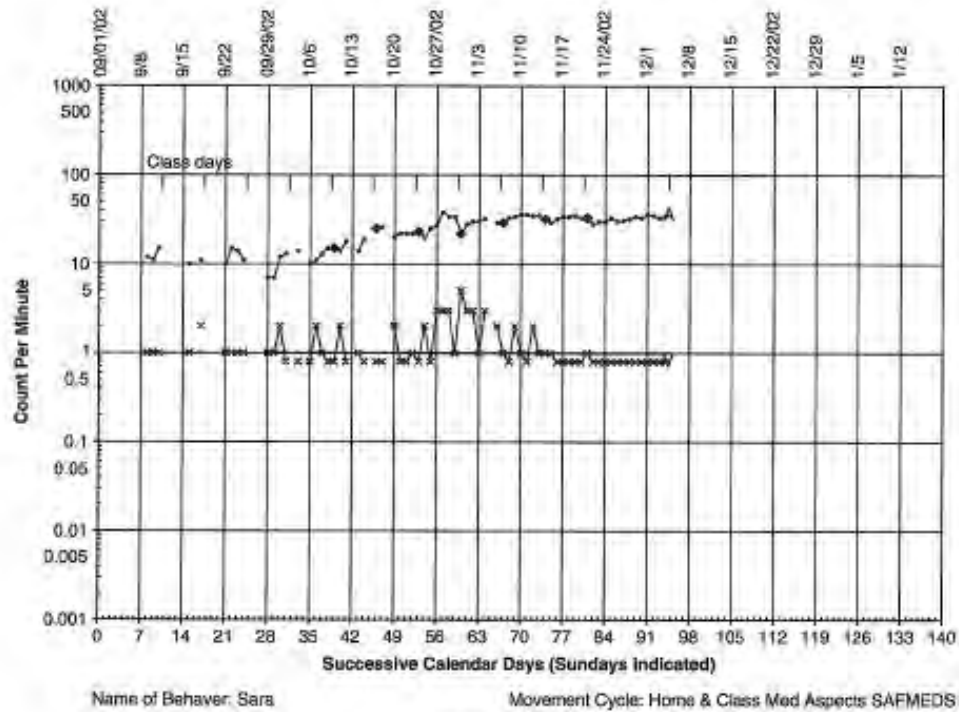
Medical

- Fetal movement
  - Diane & Joe Edwards, published in *Science*, 1970.
  - At least 10 others
- Epilepsy
  - Cornelius, Calkin
- Menopause
  - Cynthia
- Death
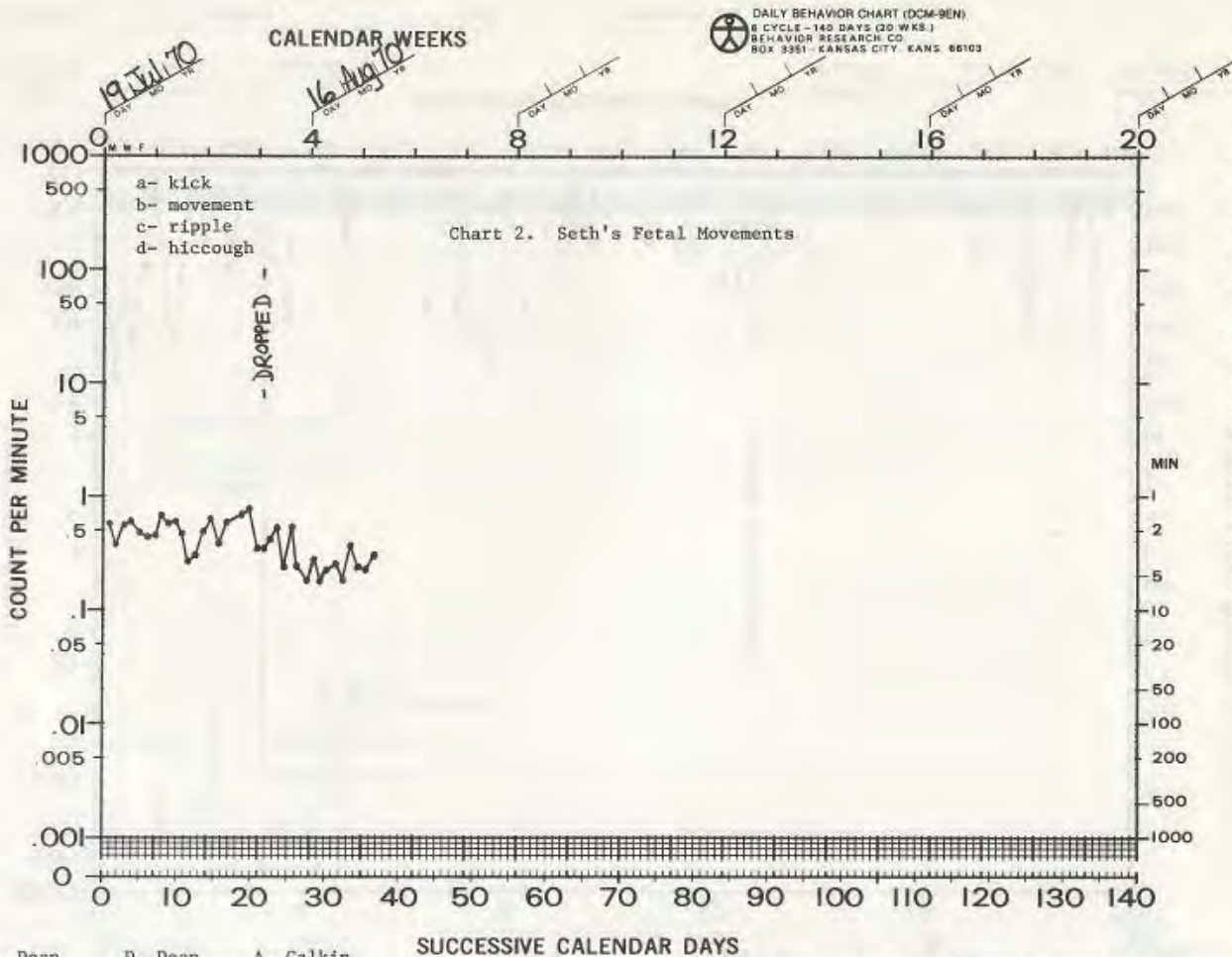 - Casson, Neely
- Student training
  - Levy, of medical school students, SAFMEDS

Fetal Movement

- Kicks
- Flutters
- Ripples
- Hiccups
- Pushes
- Turns
- Moves

Chart 1. Seth's Fetal Movements

DAILY BEHAVIOR CHART (DCM-9EN)
6 CYCLE - 140 DAYS (20 WKS)
BEHAVIOR RESEARCH CO.
BOX 3351 - KANSAS CITY, KANS 66103

CALENDAR WEEKS

1 Mar 70   29 Mar 70   26 Apr 70   24 May   21 Jun 70   19 Jul 70

COUNT PER MINUTE

Cramps   Feelings

Pleasant Feelings

a- kick
b- movement
c- ripple
d- hiccough

- NO MOVEMENT 6am - 3pm -

MIN

SUCCESSIVE CALENDAR DAYS

Calkin, Abigail B. Counting fetal movements.

D. Dean — SUPERVISOR
D. Dean — ADVISER
A. Calkin — MANAGER

DEPOSITOR   AGENCY   TIMER   COUNTER

Seth McKenzie Koch *
BEHAVER   AGE   LABEL
*born: 25 Aug 70

makes fetal movements
COUNTED

Chart 2. Seth's Fetal Movements

Epilepsy

- Data

  - confusing with no diagnosis

  - ...as was the disorder

- Types of seizures

- Learning process

  - discovery charts

Standard Celeration Chart for "Diane" showing Count Per Minute versus Successive Days (Per Week). Phase lines labeled: Baseline, All Day Self-Recording, Begin 1-Minute Timings, Set Aim at 25:2, Focus on Specific Positives.
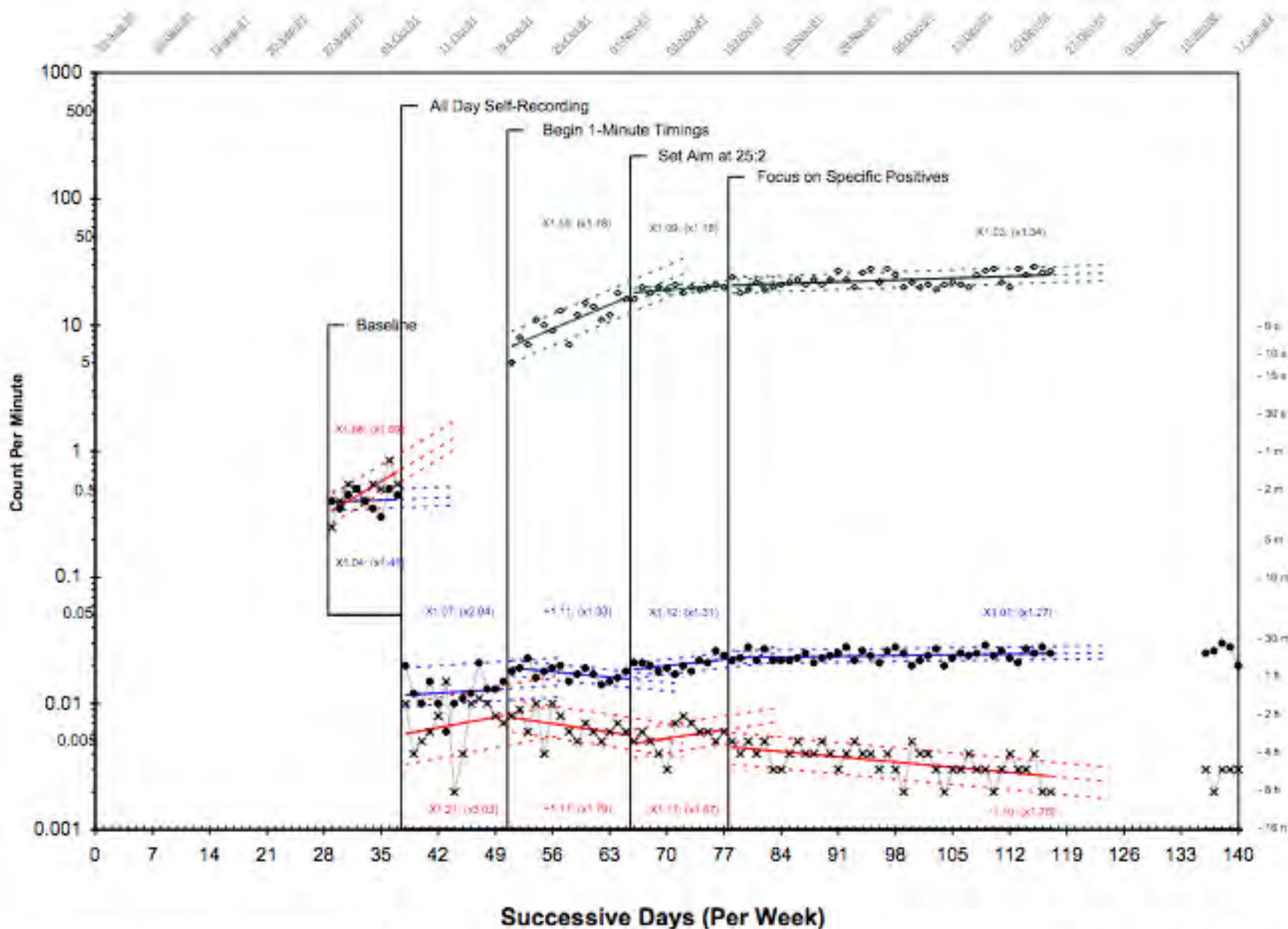
Name of Behaver: Diane (Calkin, A. 1992)

Movement Cycle: Positives (dots) vs Negatives (x's) About Self

Sheila

- Yearly charts for 20 years
- Medication after 10 years
- Types of seizures
  - Focal onset impaired (lose consciousness)
  - Tonic clonic (formerly grand mal)
  - Types of seizures
  - "Moments"
  - Dec 2017 surgery

Mpmon-3EC

MONTHLY per month CHART ™

0   1   2   3   CALENDAR YEARS   6   7   8   9   10

2/20/81 –
4/30/99 ?

1999   2000   2001   2002   2003   2004   2005   2006   2007   2008

1,000,000
500,000

100,000
50,000

10,000
5,000

1,000
500

COUNT PER MONTH

100
50

10
5

1

0

0   12   24   36   48   60   72   84   96   108   120

SUCCESSIVE CALENDAR MONTHS   Sheila

17-29

• moments
x grand mal (tonic-clonic)

COUNTED

SUPERVISOR   ADVISER   MANAGER   PERFORMER   COUNTED

ORGANIZATION   DIVISION   ROOM   TIMER   COUNTER   CHARTER

Mpmon-3EC MONTHLY per month CHART ™

MONTHLY per month form 3 English on Commodity · Standard Celeration
© 1998 BEHAVIOR RESEARCH CO. FAX ORDERS 913 362 5900
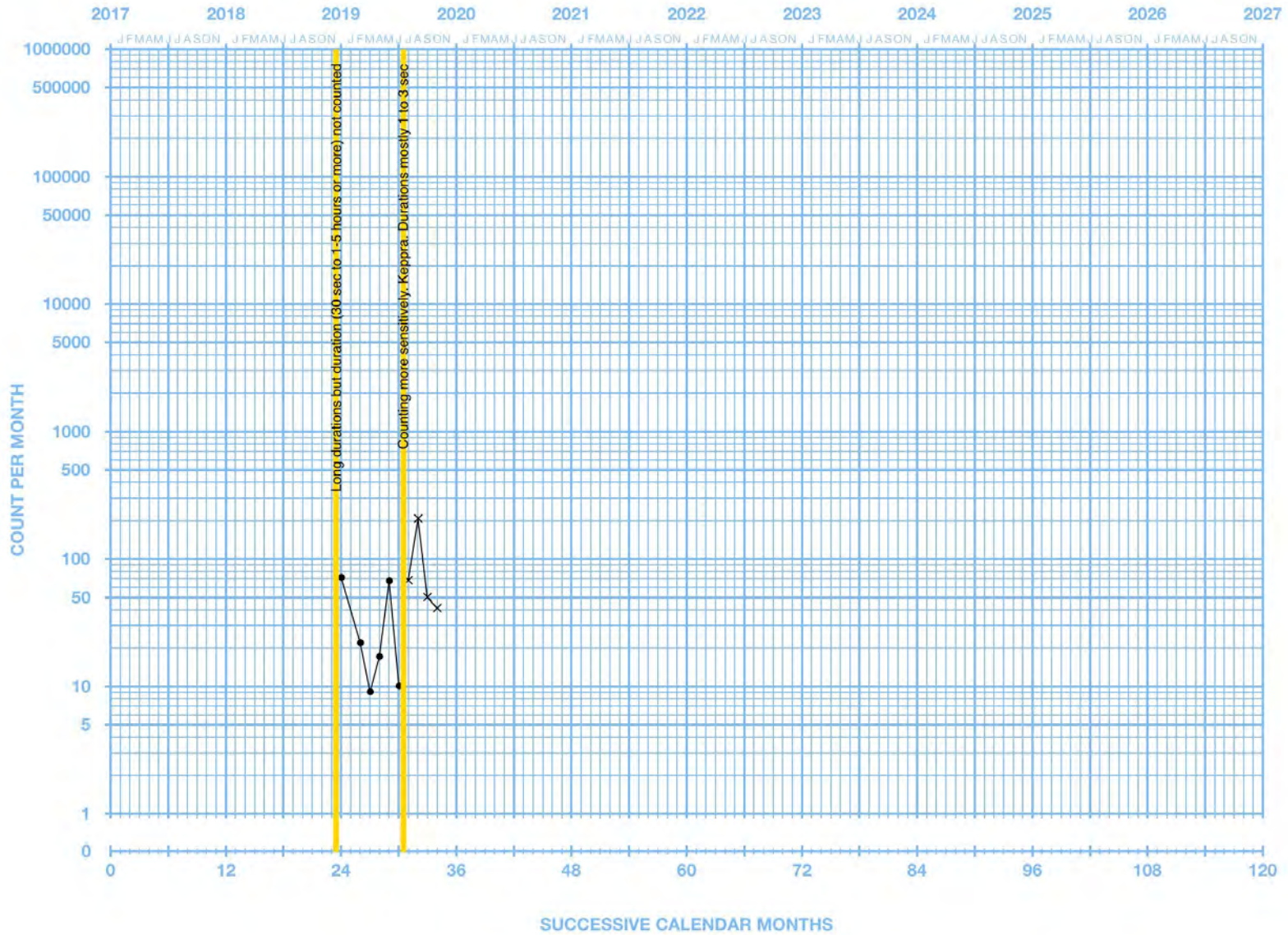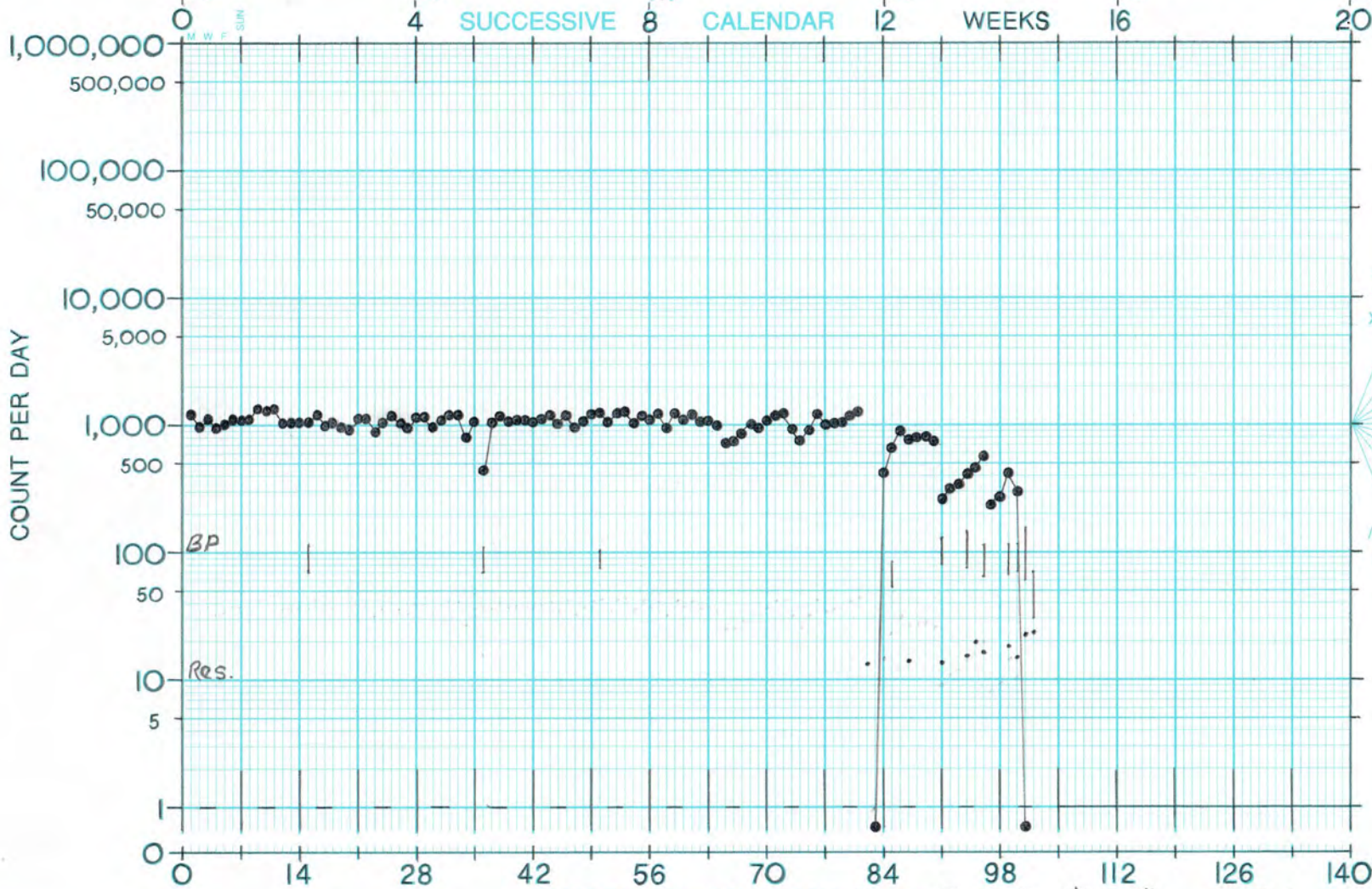BOX 3351 KANSAS CITY KS 66103-3351

CALENDAR YEARS

2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

COUNT PER MONTH

1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
100
50
10
5
1

Standard celeration
X16
X 4
X 2
X 1.4
X 1.0
/ 1.4
/ 2
/ 4
/ 16
per 6 months ™

switch on Keppra & Vigabal
received services from Heartland
Ononta → Ketogenic
off Keppra
increasing EEG
Wada test
12 hr current
move
change

SUCCESSIVE CALENDAR MONTHS   Sheila

0   12   24   36   48   60   72   84   96   108   120
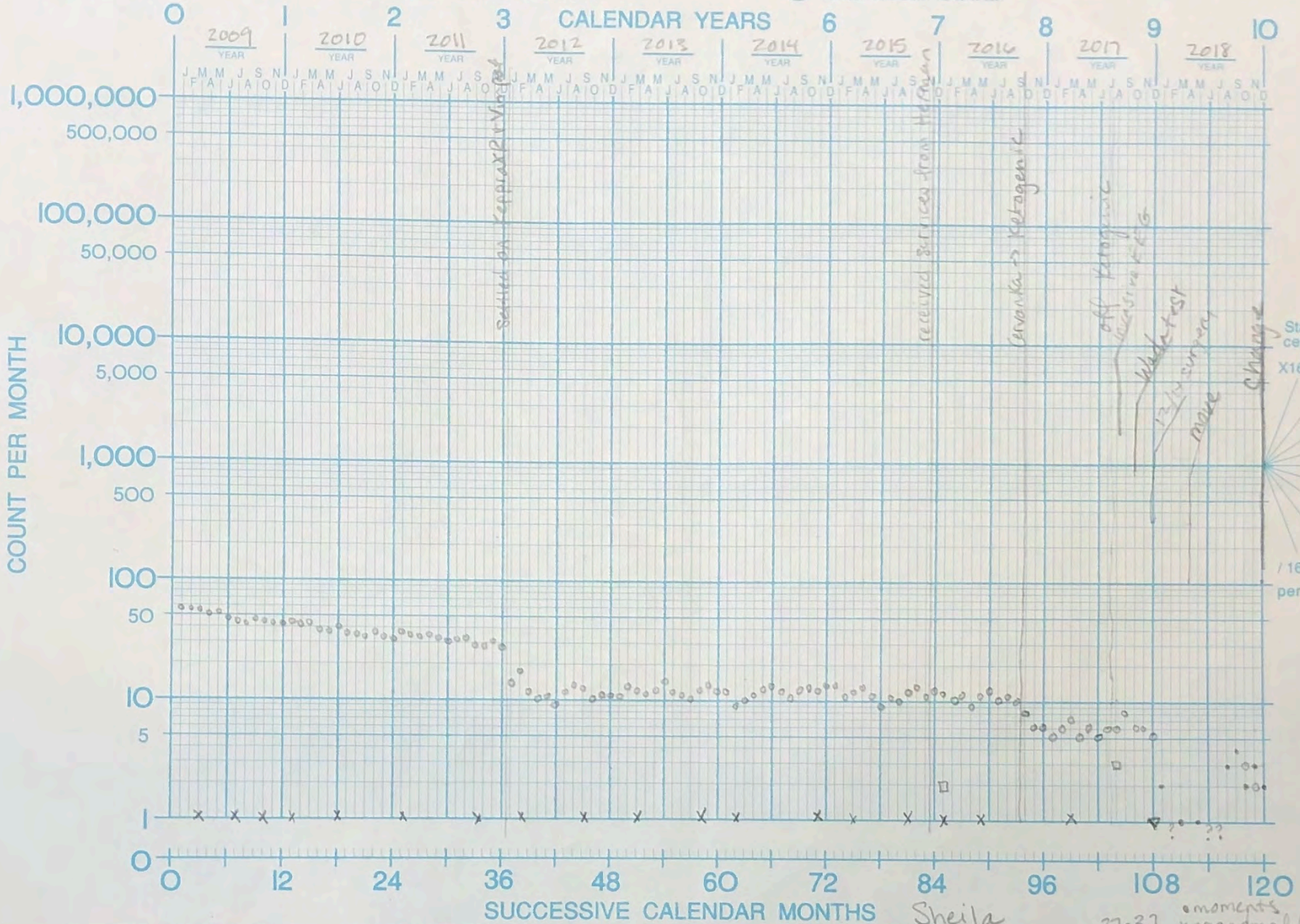
SUPERVISOR   ADVISER   MANAGER   PERFORMER   COUNTED

27-37   • moments
x grandmal (tonic-cl
◊ SP C focal onset a
▷ CP C focal impair

Abigail

- Occasional data
  - 1974-5, winter, for 14 weeks
  - 1977, spring, for 14 weeks
  - 1980, fall, 12 weeks
  - 1981-82 for 14 months
- Partial complex seizures
  - Dec 2018 to continuous present & future without then with medication

MONTHLY per MONTH CHART : Lightheaded, dizzy, out of body, natural highs, vertigo, aura

Long durations but duration (30 sec to 1-5 hours or more) not counted

Counting more sensitively. Keppra. Durations mostly 1 to 3 sec

COUNT PER MONTH

SUCCESSIVE CALENDAR MONTHS

DAILY per MINUTE CHART : Lightheaded, dizzy, out-of-body, natural high, illusions, vertig

Alaska

Cold late started @ 2230

End cold

WA, FL 9(4 SCS), CO

Rome

Th*
H:5 M:16

T*
H:2 M:30

M*
M:36

S*
H:1 M:18
T*:2H **
W*:8H

COUNT PER MINUTE

COUNTING TIMES

SUCCESSIVE CALENDAR DAYS
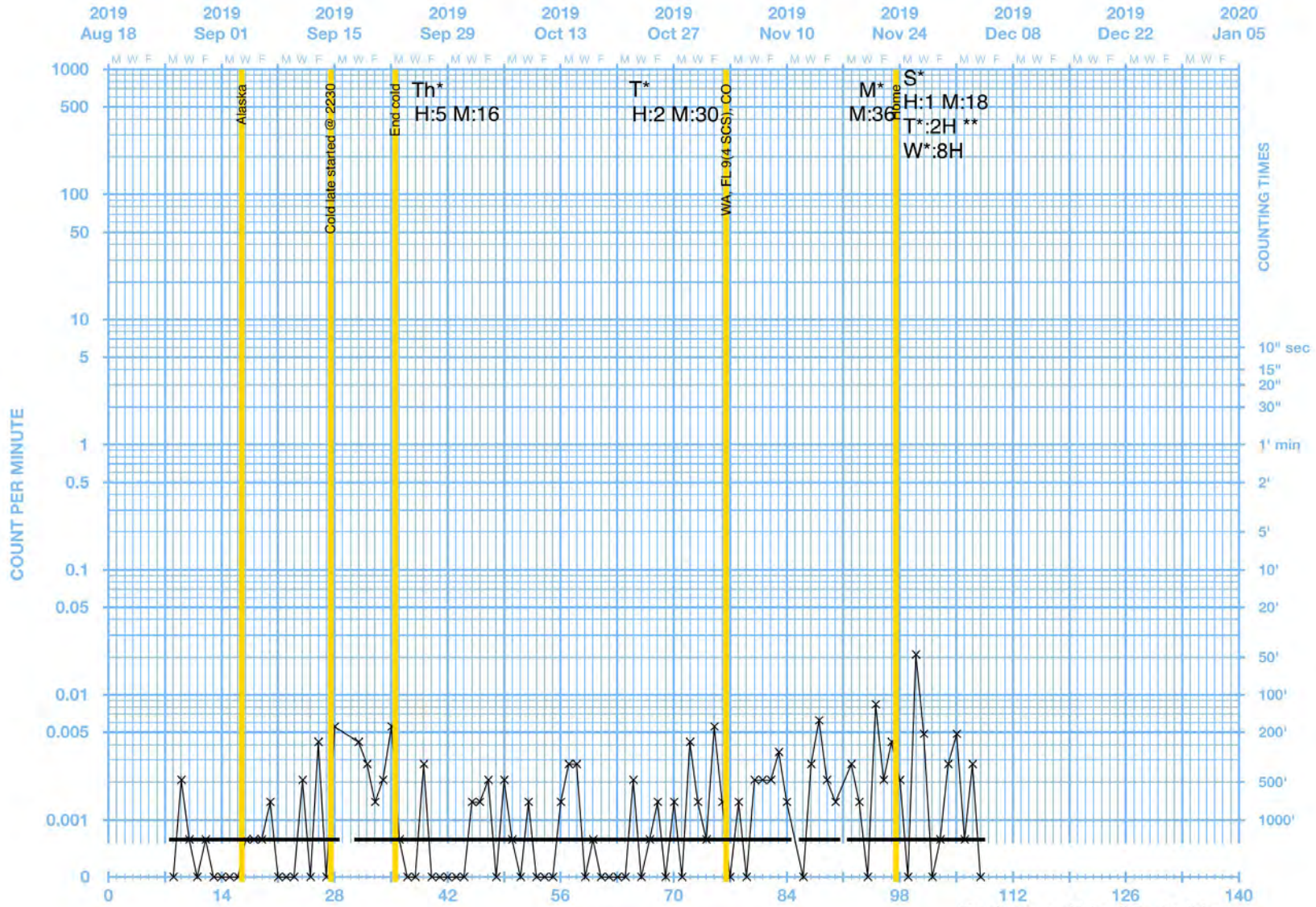
Performer: Abigail B. Calkin
* = moments   **med @0130 W

A Look at Dying

- Sue's mother—fluid intake
- Anna, Malcolm's mother—food intake

Standard Celeration Chart — DAILY per day CHART ™ (Dpday-2EC)

Handwritten labels:
- Chart title area: Sue C's "Ma"
- Counted: Intakes Fluid cc
- Counter: Sue in oz.
- Recharter: mdn

Calendar date labels across top: 12 SEP 99, 10 OCT 99, 7 NOV 99, 5 DEC 99, 2 JAN 00, 30 JAN 00

Left axis: COUNT PER DAY (1,000,000 down to 0)
Bottom axis: SUCCESSIVE CALENDAR DAYS (0 to 140)

Chart annotations: BP, Res.

CALENDAR 1/20th YEARS

ONE POSSIBLE BOUNCE AND OUTLIER INTERPRETATION

Anna's Food Intake Chart

1 Jr 02 | 3 Ap 02 | 3 Jl 02 | 3 Oc 02 | 2 Jr 03

1ST QUARTER | **2ND QUARTER** | **3RD QUARTER** | **4TH QUARTER**

COUNT PER DAY

1000000
500000
100000
50000
10000
5000
1000
500
100
50
10
5
1

verge is x 1.15

bounce is x6.58

data values= 219

highliers = 6

lowliers= 38

SUCCESSIVE CALENDAR DAYS

0 18 37 55 73 92 110 128 146 165 183 201 220 238 256 275 293 311 329 348 366
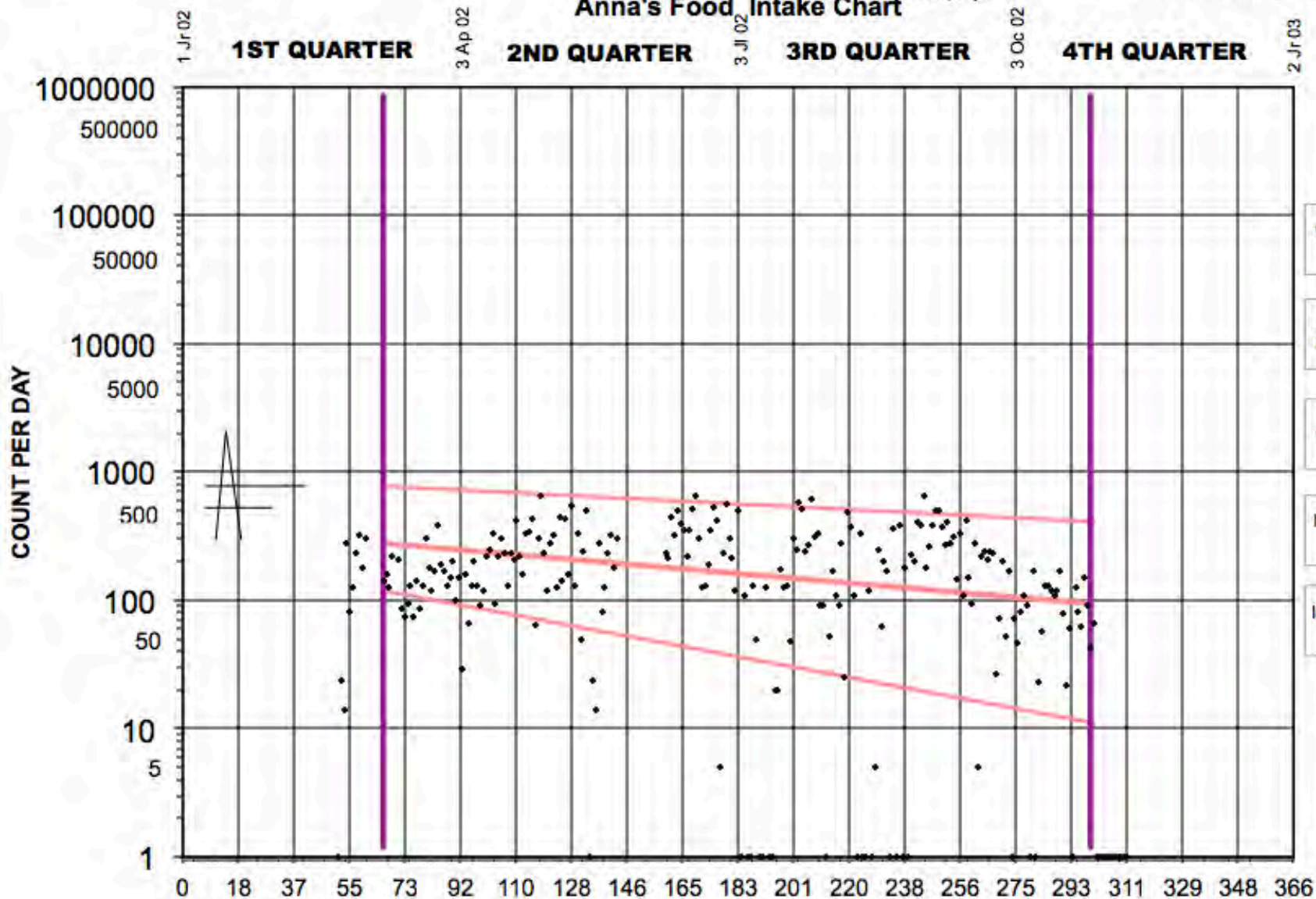
physician	nurses	assistants/mdneely			Anna	96		Intakes Pureed Food ml
SUPERVISOR	ADVISER	MANAGER			PERFORMER	AGE	LABEL	COUNTED
mdneely	h & b nursing homes (2)		mdneely	mdneely	mdneely			
DEPOSITOR	AGENCY		TIMER	COUNTER	CHARTER			

Precision Military

- Kent Corso
  - Xcelerate Innovations
    - Jim Meador
    - Mike Kondis
    - Abigail Calkin
  - Focuses on military
  - Military & Veterans ABA SIG
  - AimStar iPad program developed to monitor behavior within the military.
  - Suicide study with the Air Force National Guard (ANG) using iPad and chart for data.
- Emily Leeming
  - Paratrooper training

Military Issues

- Suicide
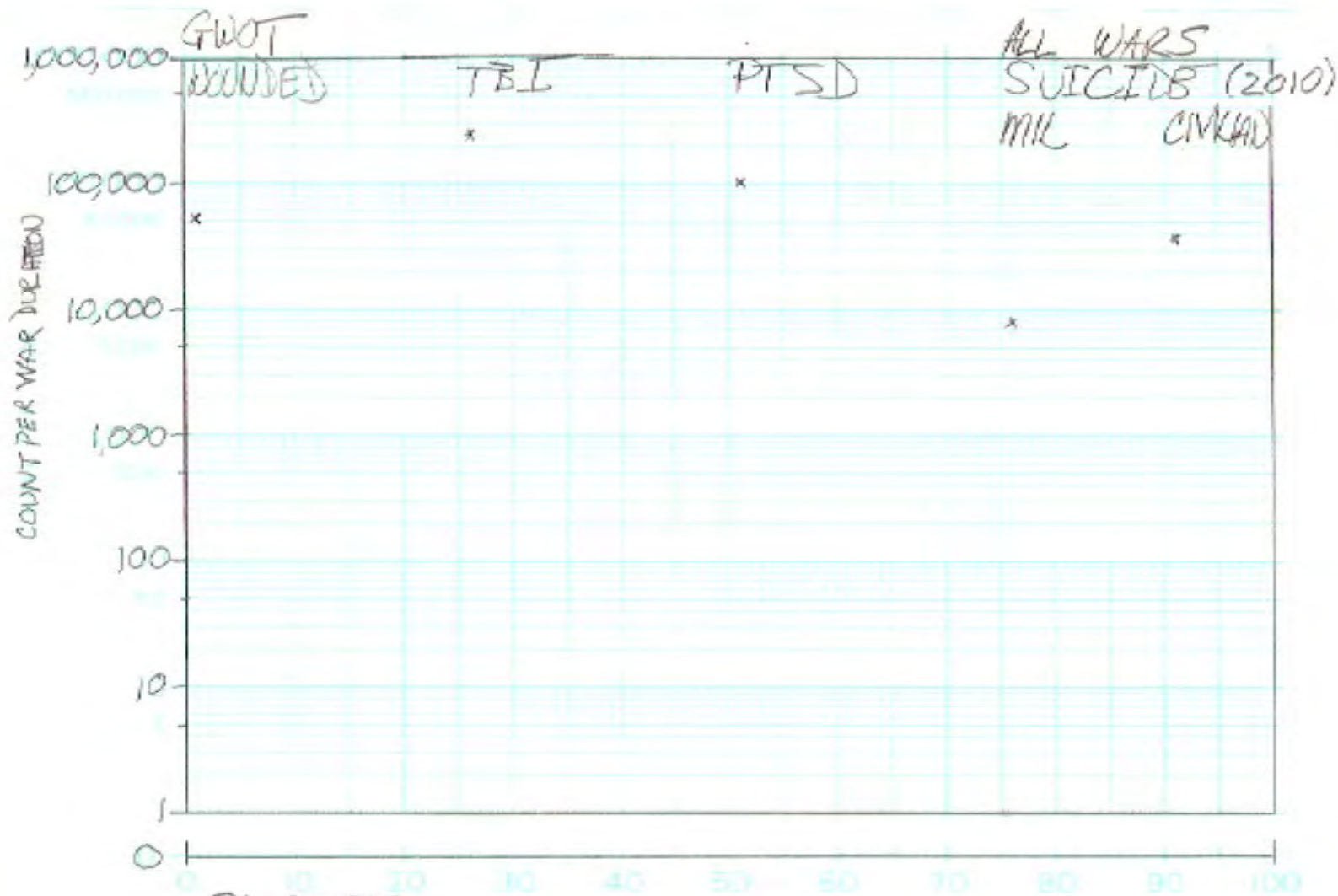- Post-traumatic Stress Disorder (PTSD)
- Traumatic Brain Injury (TBI)

CALENDAR DECADES : Military Suicides
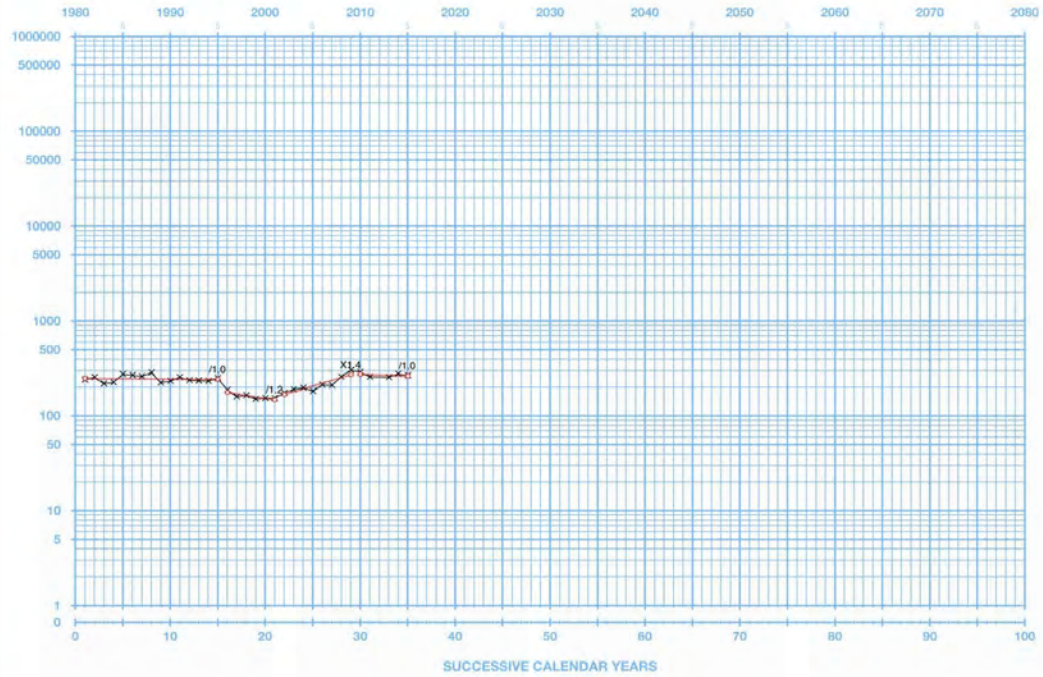
SUCCESSIVE CALENDAR YEARS

GWOT   TBI   PTSD   ALL WARS
WOUNDED   SUICIDE (2010)
                                       MIL   CIVILIAN

SOURCES:
A.B. CALKIN. www.dmdc.osd.mil.dcas...gwst...html   US MILITARY
            www.afsp.org   CALKIN

Paratrooper Training—Emily Leeming

- Team of 3 people
  - Performer
  - Timer
  - Clicker
    - per correct response
    - 0-999 clicker
- 30-sec timings

See Say equipment deficiencies

- "testable deficiencies"
  - long list of possible errors they could see on the hands-on test for a given piece of equipment.
  - At random
    - read the name of the item
    - have thirty seconds to say as many deficiencies from the testable list as they could for that item(s).
- Accomplished two things
  - Increased their rate of speech which is important because the whole test is 5 min and a lot of people fail because they simply can not talk as fast as they need to.
  - Knowing what was testable from the list reduces the likelihood that they name deficiencies that don't exist or say something close to what's on list but not quite right which gives the instructor discretion to pass or fail them.

See Point Say Equipment Part

See Point Say
"Dress the Paratrooper"

- It takes 2 people and about 10 min to get into the parachute rig.
- So "dress the paratrooper" was after they got the partner all set and in a "clean" (100% correct rigging arrangement)
  - They would say the items of nomenclature as they should see it on the test.
    - This again trained the nomenclature they would be tested on, rate of speech, and then got them so familiar with what correct looked and felt like, that any error in any arrangement would stand out very clearly to them on test day.
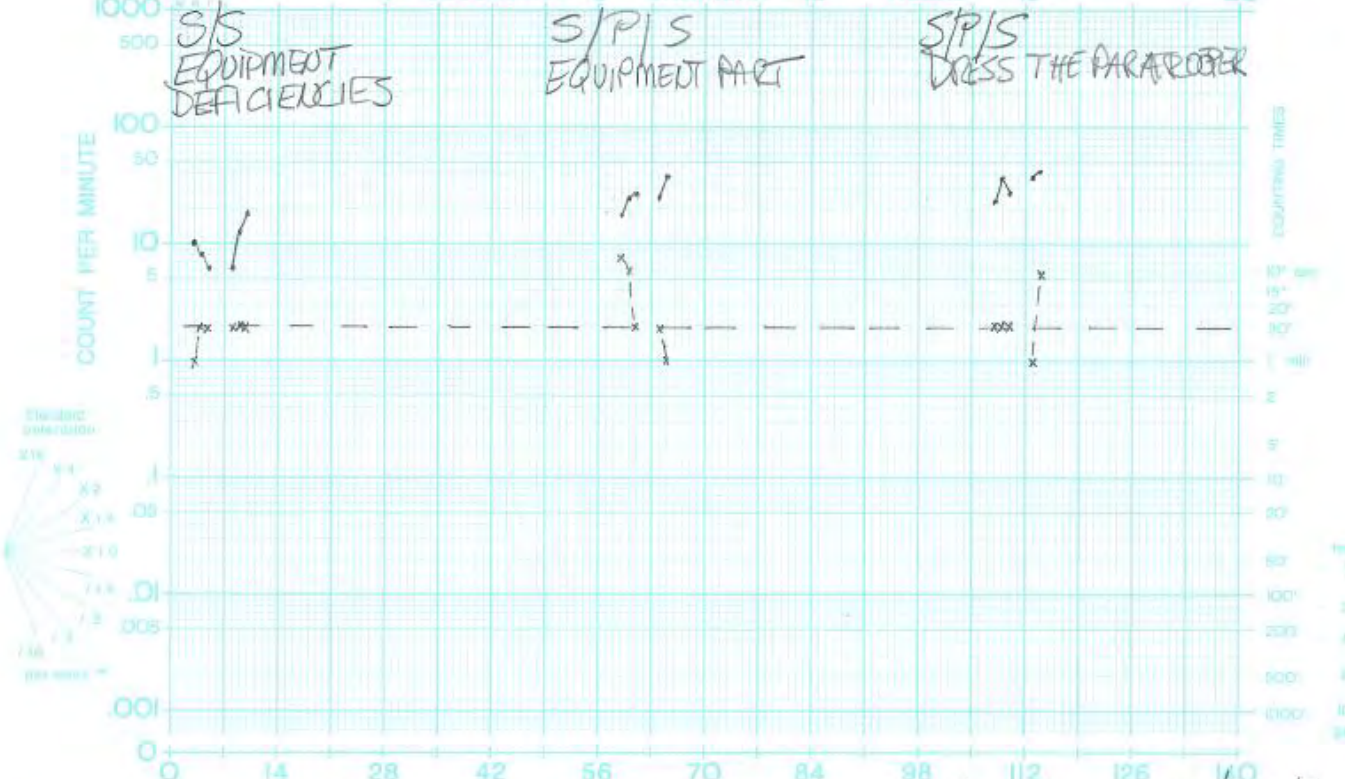
Precision Law Enforcement

- Applied Behavioral Science and Law Enforcement
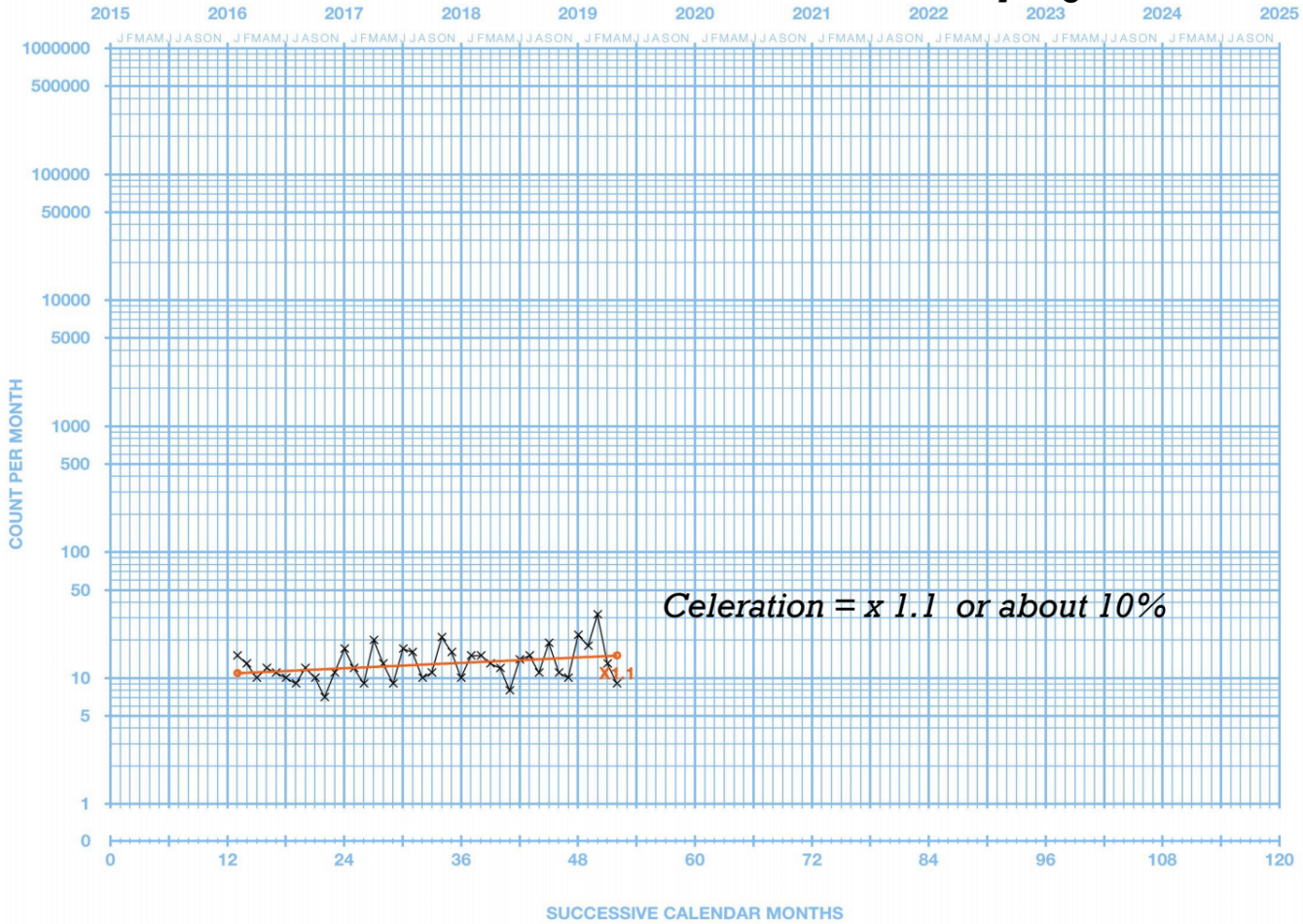 - Amy Wiech
  - 2015

YEARLY per YEAR CHART : Law enforcement officers in the United States
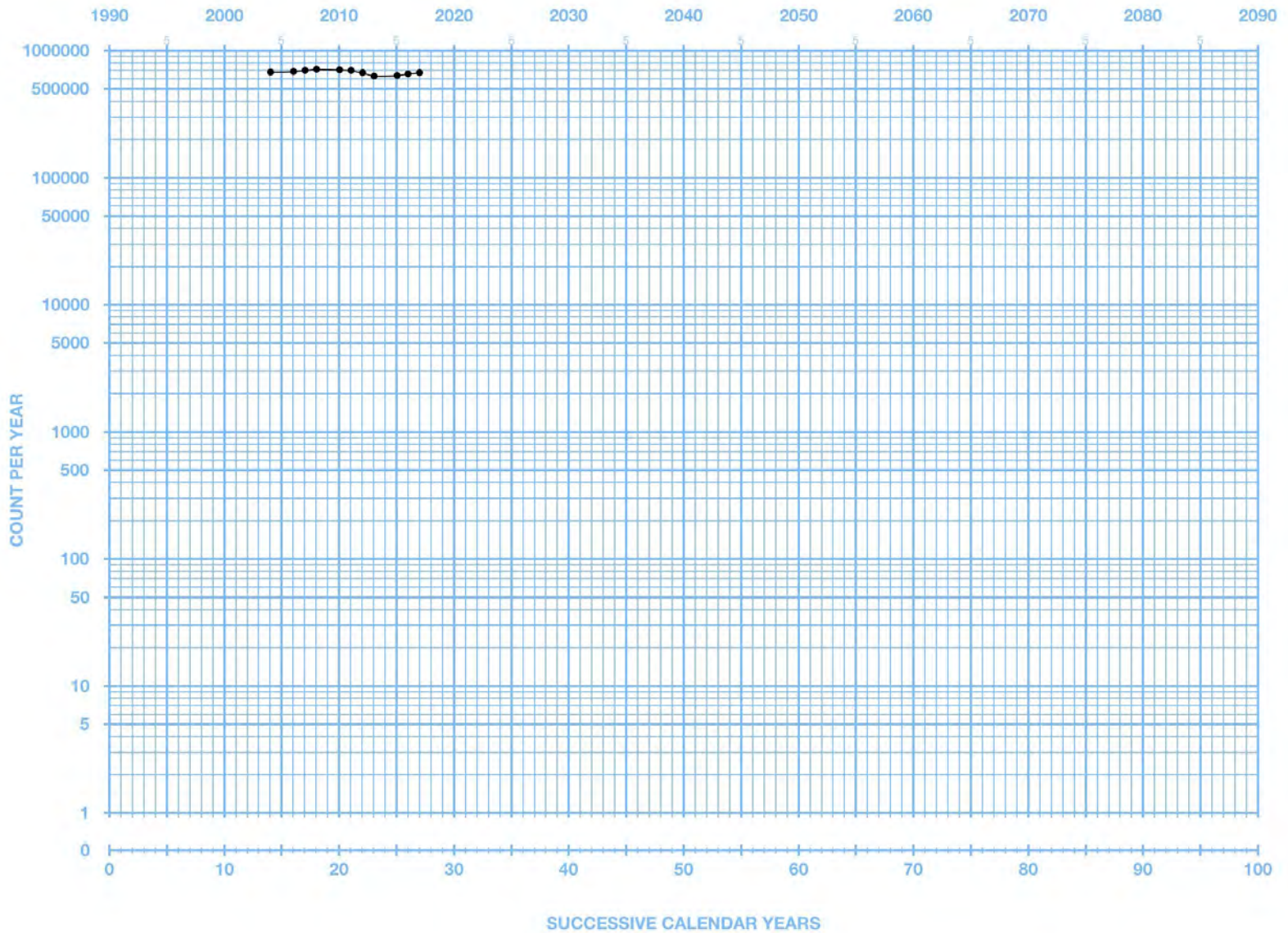
MONTHLY per MONTH CHART : BlueHelp.org

Police suicides 2016-2019   *Source: BlueHelp.org*

Celeration = x 1.1 or about 10%

COUNT PER MONTH
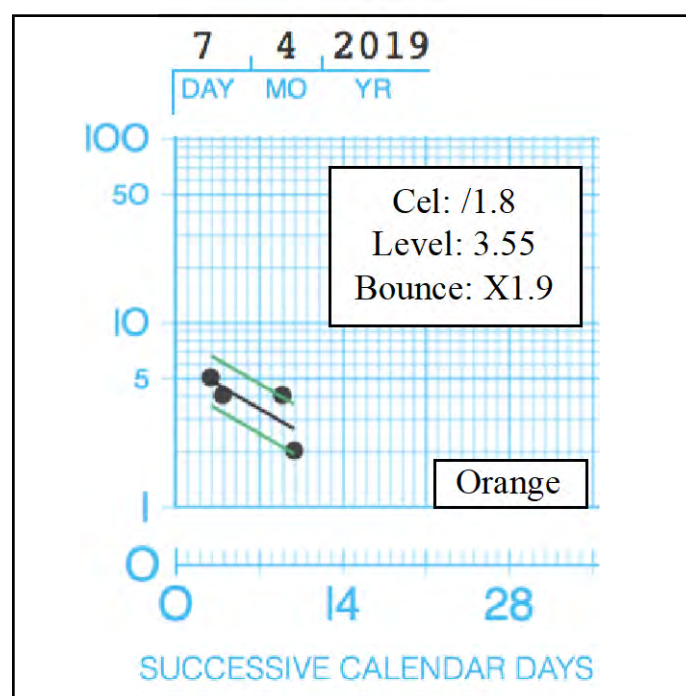
SUCCESSIVE CALENDAR MONTHS
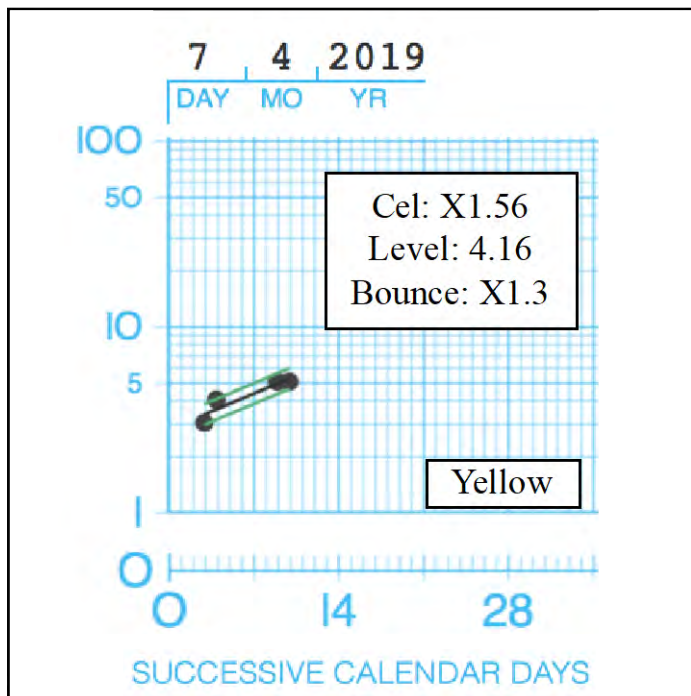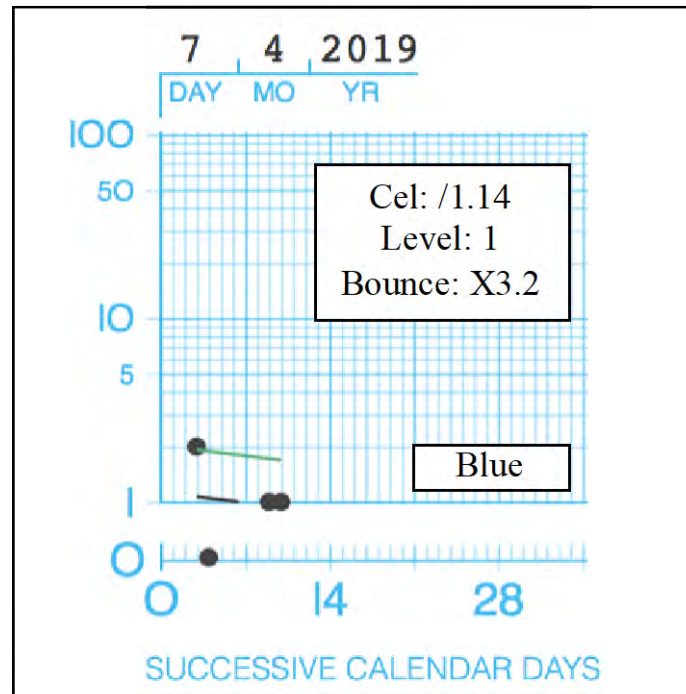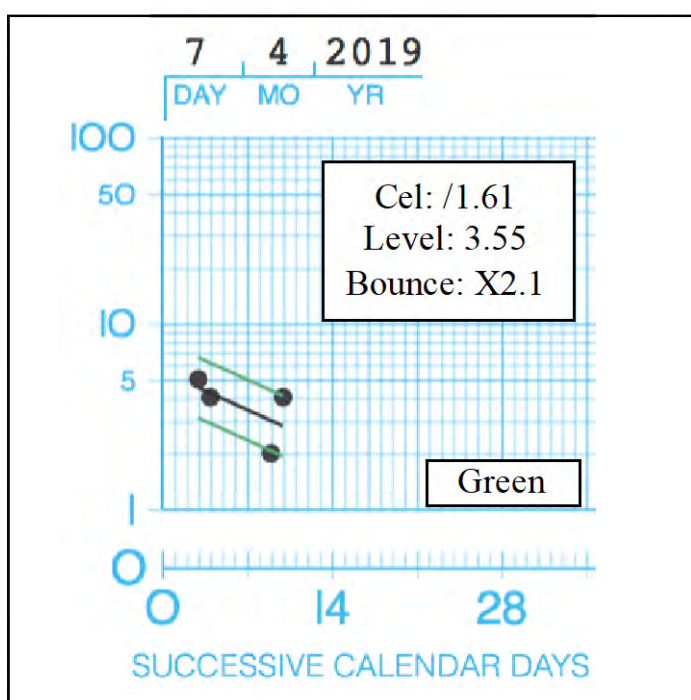
Sea Turtle training—Bulla

- Andrew Bulla, Georgia Southern University
- Neptune, the turtle
- Assistants:
  - Devin Dumont, Aquarium curator
  - Lisa Olenderski, Aquarium curator

Program—Latency Charts

Latency for each frequency of "resetting" the time from when Neptune ate the food to when she swam to the back of the tank between two marked lines.

– Phase change "color contrast" was rotating between 3 different colored backgrounds to get her acclimated to new stimuli being in the tank.

- This allowed the preference assessment to run more smoothly, because she didn't hover at the from of the tank for long periods of time.

- Also controlled for her proximity to the stimulus being a variable that affected responding!

- Latency for each frequency of "resetting" time from when she ate the food to when she swam to the back of the tank between two marked lines.
- Phase change "color contrast" was when we rotated between three different colored backgrounds to get her acclimated to new stimuli being in the tank.
  - Allowed the preference assessment to run smoothly, because she didn't hover at the front of the tank for long periods of time.
  - Controlled for her proximity to the stimulus being a variable that affected responding!

Green

7 4 2019
DAY MO YR

Cel: /1.61
Level: 3.55
Bounce: X2.1

SUCCESSIVE CALENDAR DAYS

Blue

7 4 2019
DAY MO YR

Cel: /1.14
Level: 1
Bounce: X3.2

SUCCESSIVE CALENDAR DAYS

Yellow

7 4 2019
DAY MO YR

Cel: X1.56
Level: 4.16
Bounce: X1.3

SUCCESSIVE CALENDAR DAYS

Orange

7 4 2019
DAY MO YR

Cel: /1.8
Level: 3.55
Bounce: X1.9

SUCCESSIVE CALENDAR DAYS

References

- See handout.