



MyPath

Mindfulness And Yoga Peer Ambassador

Intervention To Reduce Violence In The
Networks Of Homeless Youth

Robin Petering, Nicholas Barr + Ajitesh Srivastava

Violence and youth homelessness

Homeless youth at higher risk than housed peers because associated risk factors i.e. subsistence strategies, drug and alcohol abuse, childhood trauma, exposure to perpetrators, childhood experiences, subsistence survival strategies, and exposure to perpetrators during street tenure.



In the previous month...

60%

had been in a
physical fight

30%

had been injured
from a fight

20%

had to seek medical
attention



In the previous month...

63%


in a verbal conflict
that they thought
would escalate to a
physical fight

46%

tried to stop a
physical fight
between two
people

26%

Have been in a
physical fight with
someone in their
immediate social
network



VIOLENCE

PREVENTING

emotional physical
psychological threshold

causes

disrespect boundaries
jealousy strong emotion
scarce resource

risks

consequences

SAFETY

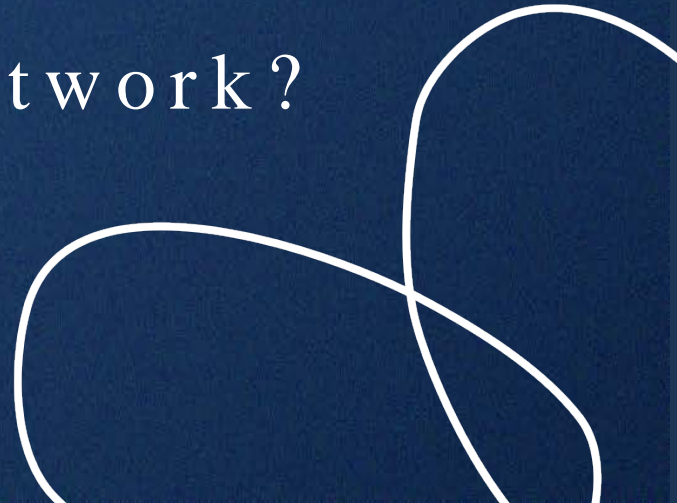
ARRESTED IRRATIONAL
escalates

Youth Perceptions of Violence

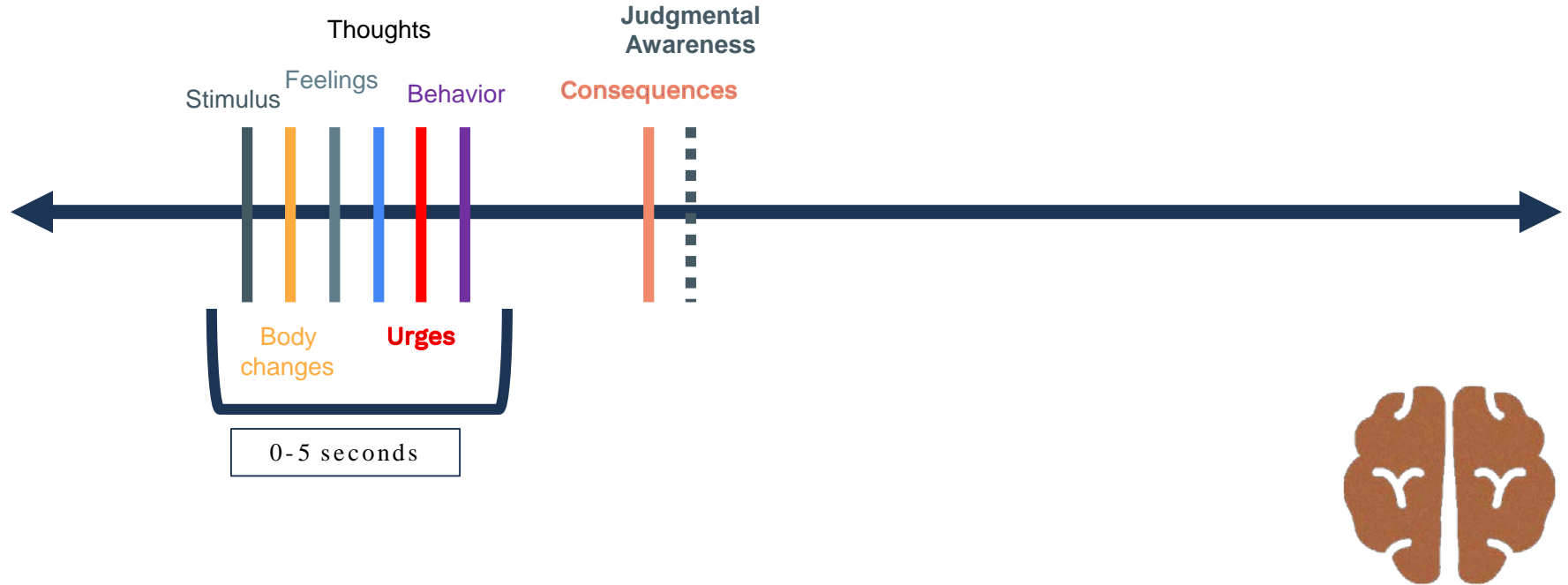
Little to no positive outcome related to violence engagement

- Physical health impacts
- Mental health impacts
- Legal law enforcement involvement
- Barrier for exiting homelessness
- Spreads like a contagion

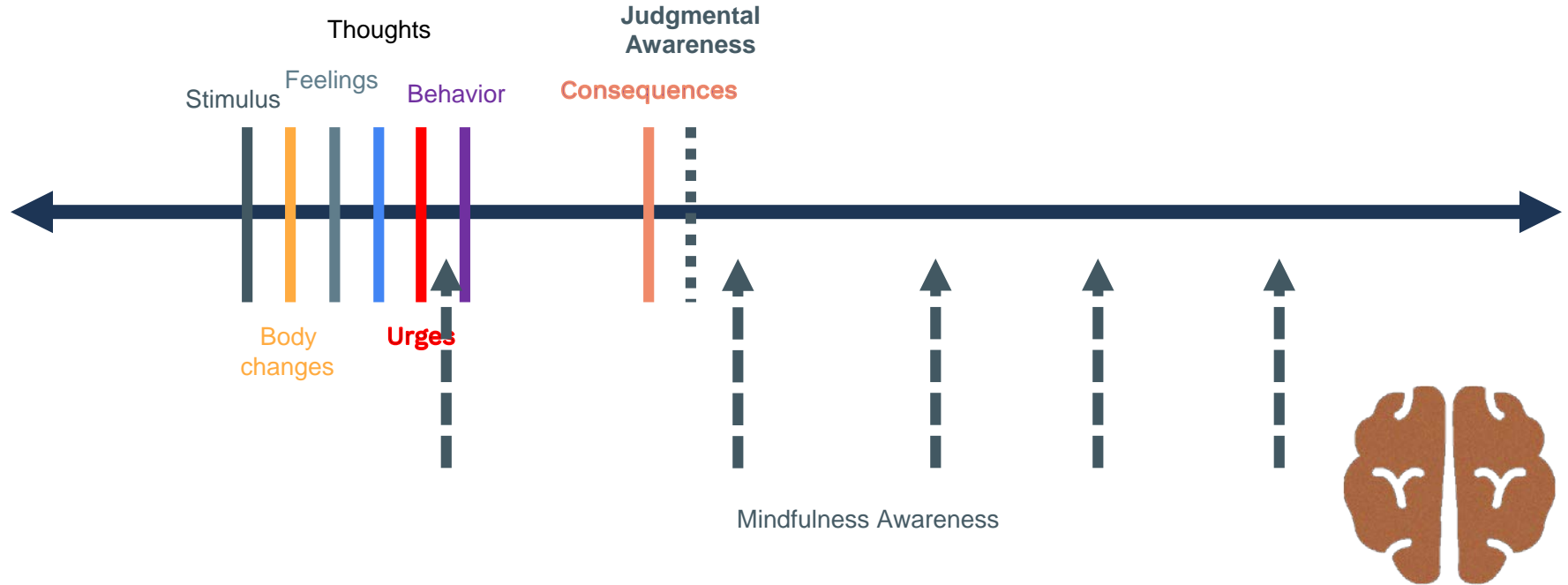
If violence is contagious, how
do we make “non violence”
spread through a network?



Extending the reactivity timeline



Extending the reactivity timeline



Habits are like freeways

Mindfulness can provide
freeway exits to alternative
behaviors

These will be hard to see at first, but with practice they'll
get easier to spot. Eventually, these **alternatives** can
become **stronger** than the **original** behavioral path



Mindfulness can provide psychological armor

By providing a cognitive/emotional buffer and
helping reduce reactivity to thoughts, feelings and
urges

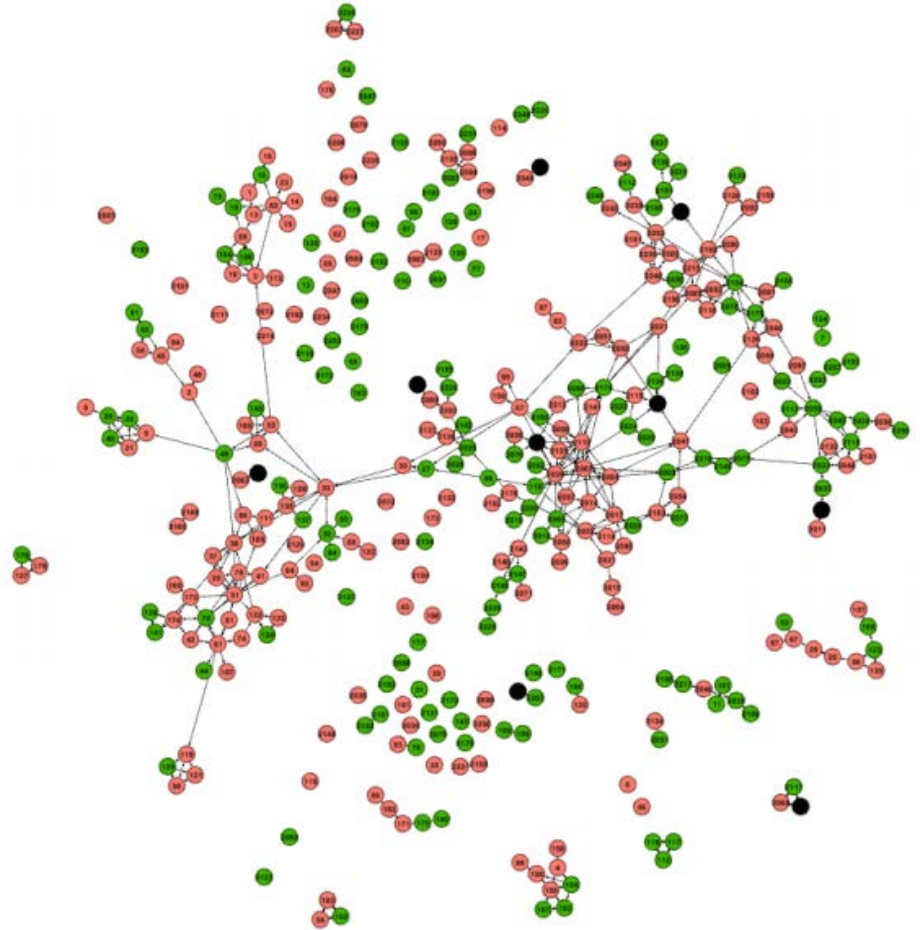


How do we
introduce
mindfulness in the
a network to have
the greatest impact
on reducing
violence in a
network?



Towards Violence Minimization - Modeling

- Violent individuals tend to be connected to other violent individuals
- Violent individuals may become non-violent, and vice-versa
- Violence is a non-progressive diffusion process
- Challenge: Uncertainty in network structure obtained from survey

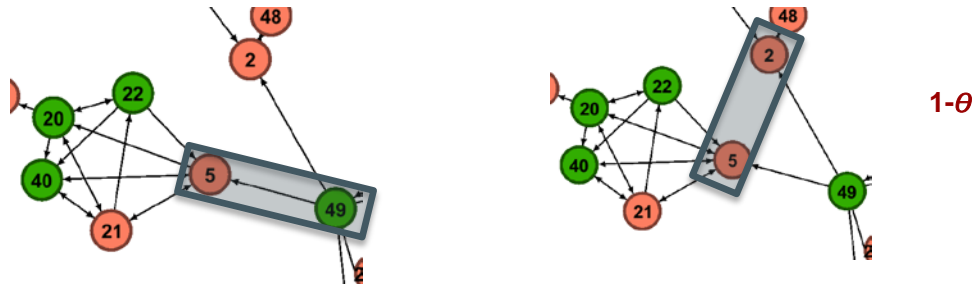


Problem Definition

- *Assumption: Violence is a non - progressive diffusion process*
- Given
 - Current state of violence - a graph $G(V, E)$ and a set of nodes S that are violent
 - Intervention resources - an integer k
- To find
 - Best k individuals for performing intervention - $T \subseteq S$ such that $|T| = k$, and turning the nodes in T into non-violent (deterministic/probabilistic) minimizes expected number of violent nodes.
- Assuming
 - Diffusion is dictated by “Uncertain Voter Model” ...

Uncertain Voter Model

- At every time step a node u picks a node v and takes its state
- With probability θ : v is randomly selected from neighborhood of u [Classic Voter Model]
- With probability $1-\theta$: v is randomly selected from outside of the neighborhood [Based on link prediction: Katz similarity]



Uncertain Voter Model (2)

- Probability of v adopting the state of u

$$q_{\theta}(v, u) = \begin{cases} \theta p_{v,u} & \text{if } p_{v,u} > 0 \\ (1 - \theta)K'(u, v) & \text{if } p_{v,u} = 0 \end{cases}$$

$$K = \sum_{i \geq 2} \alpha^i M^i = \alpha^2 M^2 (I - \alpha M)$$

$$K'(u, v) = K(u, v) / \sum_w K(u, w)$$

- Probability of u being violent

$$x_{u,t} = \sum_v q(v, u)x_{v,t-1} \text{ or } \mathbf{x}_t = Q_{\theta} \mathbf{x}_{t-1}$$

- Uncertainty in time

$$\mathbb{E}(I_V^T \mathbf{x}'_t) = \sum_{\tau} P(t = \tau) I_V^T Q_{\theta}^{\tau} \mathbf{x}'_0 = I_V^T \left(\sum_{\tau} P(t = \tau) Q_{\theta}^{\tau} \right) \mathbf{x}'_0$$

- Objective: Select k nodes and flip them to 0 to maximizes

$$Q_{\theta}^t$$

$$I_V^T \Delta \mathbf{x}_t = I_V^T Q_{\theta}^t \Delta \mathbf{x}_0 = \sum_{\{u | \Delta \mathbf{x}_0(\mathbf{u})=1\}} I_V^T Q_{\theta}^t I_u$$

Modeling Intervention Response

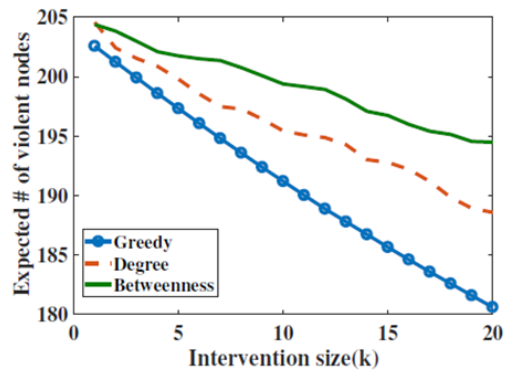
- New probability of violence after intervention at $t = 0$: $x_{u,0} \leftarrow x_{u,0}(1 - s_u(z_u))$,
 $s_u(z_u)$: success probability (response) of intervention after applying z_u resources to node u
- Examples:
 - $s_u(z_u) = 1$, if $z_u > 0$
 - $s_u(z_u) = 1 - r_u^{z_u}$ for a constant $0 \leq r_u \leq 1$.
- New Objective: $I_V^T Q_\theta^t \Delta \mathbf{x}_t = \sum_u I_V^T Q_\theta^t I_u s_u(z_u)$

Violent and open to intervention

Well-connected
- Theorem: If intervention response is a concave function, greedy algorithm is the optimal intervention strategy.

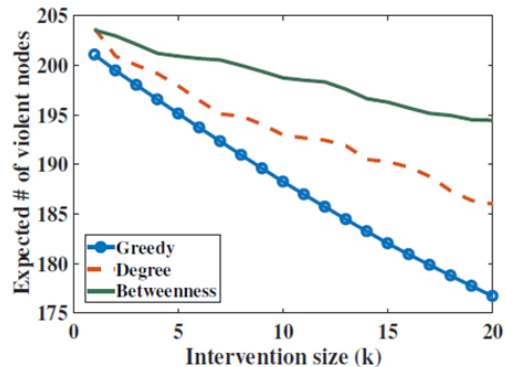
Experiments on Real Homeless Network

- Deterministic Intervention



- Probabilistic Intervention

- $s_u(z_u) = 1 - r_u^{z_u}$
- r_u selected at random



Experiments on Real Homeless Network

- 369 nodes, 558 edges. 55% nodes violent

TABLE I
TOP 10 SEEDS FOR VARIOUS VALUES OF θ OUTPUT BY GREEDY MINIMIZATION

θ	Selected Seeds										$\mathbb{E}(I_V^T \mathbf{x}'_t)$
1	47	4	2156	51	13	2086	169	2115	2099	2056	179.43
0.9	47	4	2156	2086	51	13	169	2115	2056	2099	183.327
0.8	47	4	2086	2156	51	13	169	2115	2056	89	185.86
0.7	47	4	2086	2156	51	2115	13	169	2056	2125	187.54
0.6	47	4	2086	2115	2156	51	169	13	2056	2125	188.66
0.5	47	4	2086	2115	2156	51	169	13	2056	2125	189.43

TABLE II
TOP 10 SEEDS FOR VARIOUS VALUES OF t OUTPUT BY GREEDY MINIMIZATION

t	Selected Seeds										$\mathbb{E}(I_V^T \mathbf{x}'_t)$
2	47	2086	4	2115	51	2156	169	13	2056	2125	189.92
4	47	4	2086	2115	51	2156	169	13	2056	2125	188.66
6	47	4	2086	51	2156	2115	169	13	2056	2125	187.81
8	47	4	2086	51	2156	2115	13	169	2056	2125	187.22
10	47	4	2086	2156	51	13	2115	169	2056	2125	186.79
12	47	4	2086	2156	51	13	2115	169	2056	2125	186.45

Same nodes appear multiple times for different parameter settings

Transition to Practice

- SPY: 96 nodes, 58 overlapped in the follow-up
- Need to “measure” probabilities of influence: assumed uniform
- Need to “measure” $x_{u,0}$, given X_u : number of violent incidents for u

$$x_{u,0} = \textit{sigmoid} \left(\frac{X_u - \mu(X_u)}{\textit{std}(X_u)} \right)$$

- Need to “measure” response to intervention

$$s_u = \textit{sigmoid} \left(\frac{S_u - \mu(S_u)}{\textit{std}(S_u)} \right)$$

MyPath Pilot Study

Summer 2018



Methods

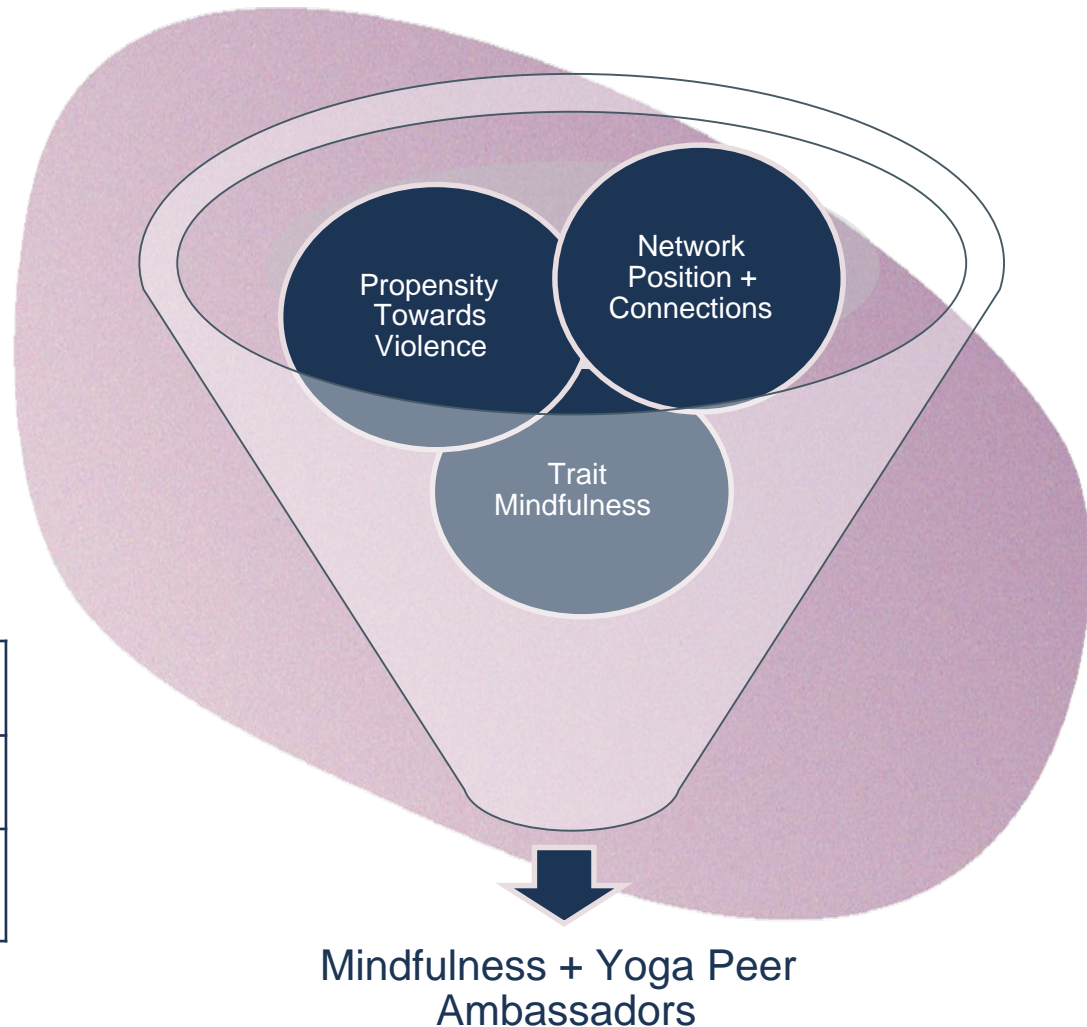
- Purposive sample of 58 young adults experiencing homelessness or housing instability (YAEH)\
- Quasi experimental pre- post-test.
- Enrollment → MyPath → T2 assessment
- Self-administered survey: recent violence, trait mindfulness, impulsivity, demographics, mindfulness and yoga practice.
- Sociometric network data collected

MyPath Peer Ambassadors

14 Mindfulness and Yoga Peer Ambassadors
trained in one -day MyPath workshop.

8 attended 100% of the follow up sessions.

	Mean	Std Dev.
Violmin non - MYPA	0.228	0.237
Violmin MYPA	0.661	0.538



MyPath intervention

1 day workshop using a train-the-trainer approach: Mindfulness and Yoga Ambassadors

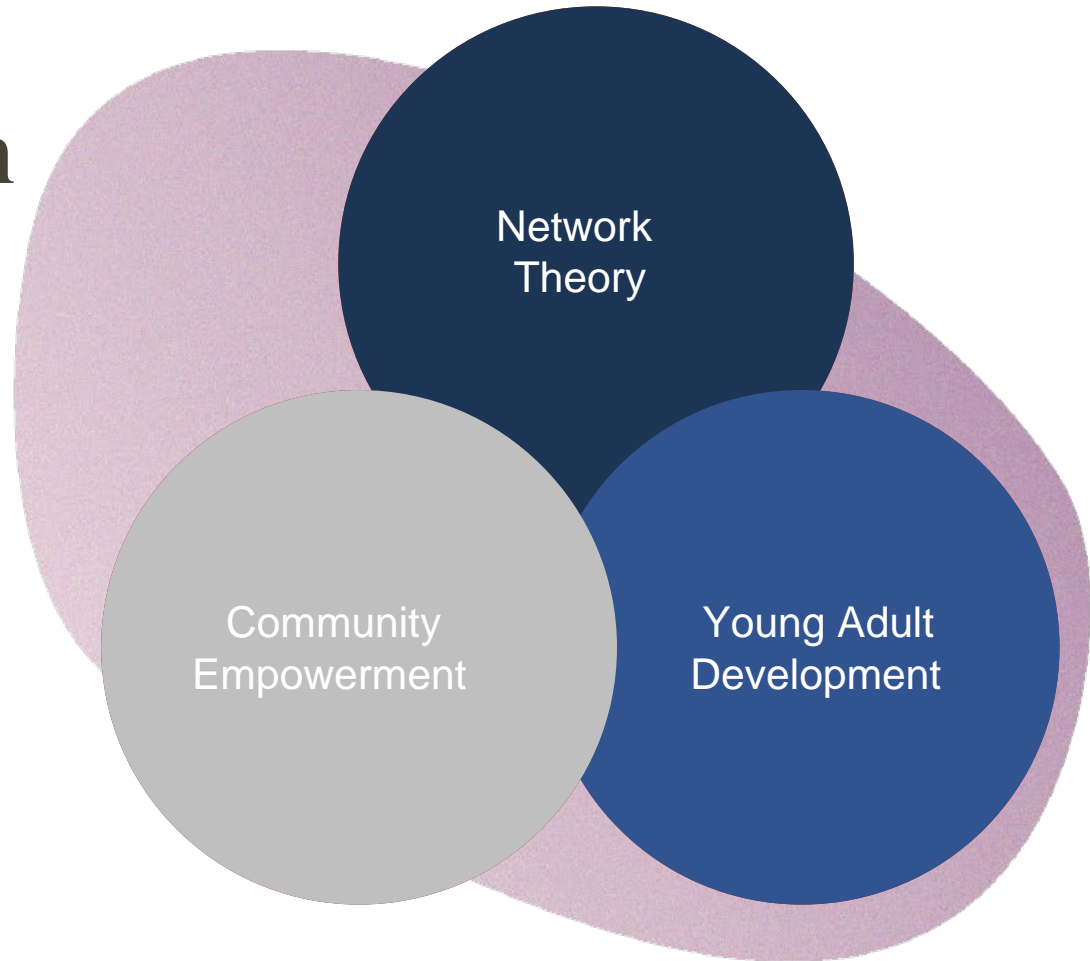
What is violence? What are the causes and consequences?

Heavy on bio - psycho education

Experiential learning on how to practice mindfulness and mindfulness in motion (yoga) to regulate emotions and physiology

Continued the program 10 weeks. Each week Ambassadors encouraged their friends to attend

8 of 12 ambassadors attended 100% of the workshops



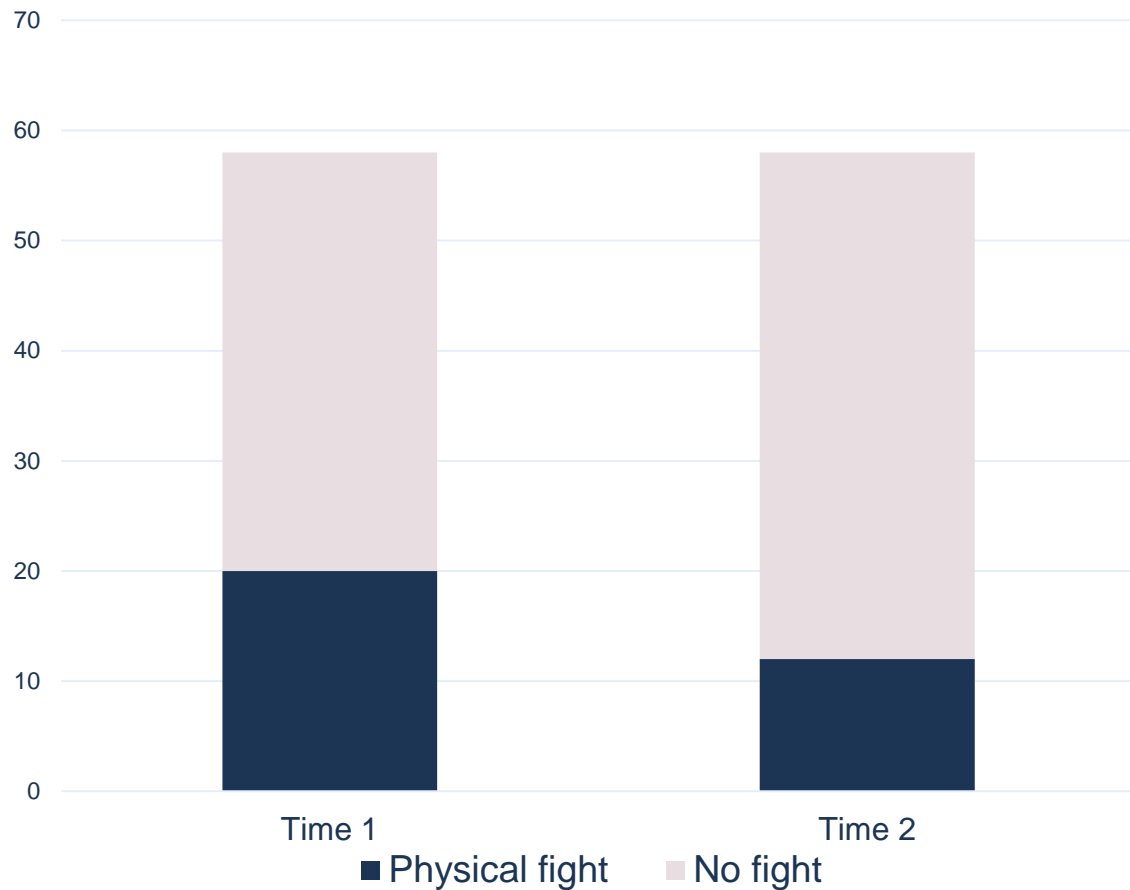


Mindfulness + Yoga



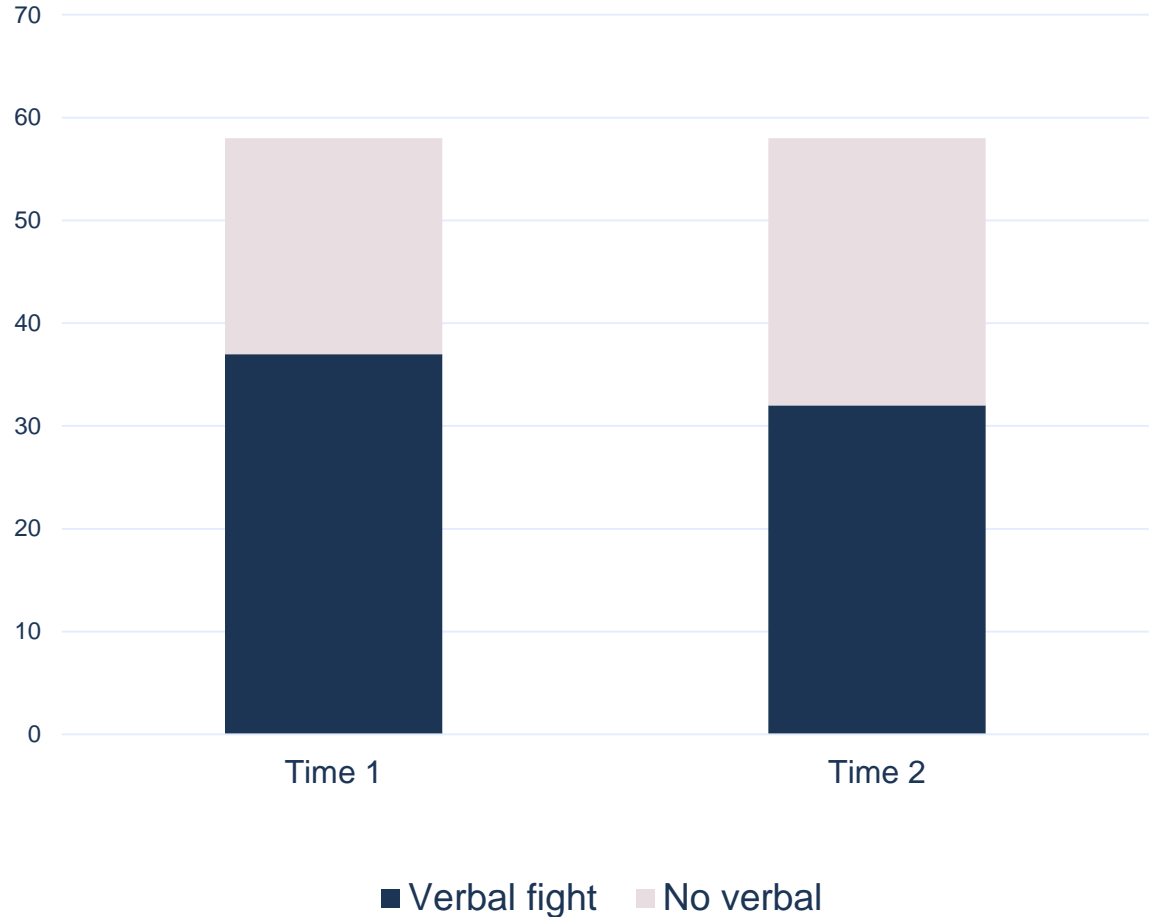
Have been in a physical fight in the past month

- Significant decrease overall at time 2, 1 month after MyPath Peer Ambassador workshop trainings complete.



Have been in a verbal fight that felt like it might escalate to a physical fight in the past month

- Significant decrease overall at time 2, 1 month after MyPath Peer Ambassador workshop trainings complete.





On being a MyPath Ambassador

“It was a good experience, it got me out of comfort zone, never thought about doing yoga that’s for sure. It started helping me in my everyday life from my anger, to becoming more humble. It helped me a lot.”



On what mindfulness means

“It’s the stage in the middle before going to 0 - 100 it’s that 50. Where you get to decide what you want to do. Let’s not entertain this nonsense, let me the bigger person and walk away, several occasions this happened to me. Mindfulness helped a lot in my life.”



On how it has impacted daily life on streets

“A guy stole some money from me 1 month ago. I ran into him 2 weeks ago, and I immediately wanted to start screaming at him. Instead I didn’t say anything to him. I used mindfulness to avoid an altercation. I saw my emotions for what they are before I reacted to them.”

Reducing violence imperative to successful exit out of homelessness

25%

have had services interrupted because they have been in fight with other member

8%

have had services interrupted because they have been in fight with a staff

23%

have lost their housing situation (shelter, apartment, staying with friends or family) because you've gotten in a fight or conflict



Key takeaways



Violence is a core problem in homeless young person's social networks.

- A large proportion of young people experience high - frequency physical violence.
- Violence disrupts formal and informal support structures and services

Participants demonstrate interest in mindfulness and yoga based coping and emotion regulation strategies

- Ambassadors were highly engaged with the MyPath intervention
- Ambassadors demonstrated mastery of concepts and applied them in vivo

Increases in mindfulness and yoga practice behavior
and decreases in violence within the network



Innovative modeling and approach for reducing violence is feasible.

Strategic selection of Peer Ambassadors works

Increases in mindfulness and yoga practice behavior and decreases in violence within the network

Next Steps

Randomized controlled trial to
test efficacy + effectiveness
National Science Foundation
National Institute of Health



Research

Implementation



safe place for youth
Dept. Of Mental Health
Los Angeles
Formalize manual
Facilitator training



Future Work in Modeling

- Incorporate Propensity for Violence

$$\begin{aligned}x_{u,t} &= \frac{\alpha(u) \sum_j q_{\theta}(v, u) x_{v,t-1}}{\alpha(u) \sum_v q_{\theta}(v, u) x_{v,t-1} + (1 - \alpha(u)) \sum_v q_{\theta}(v, u) (1 - x_{v,t-1})} \\ &= \frac{\alpha(u) \sum_j q_{\theta}(v, u) x_{v,t-1}}{\alpha(u) \sum_v q_{\theta}(v, u) x_{v,t-1} + (1 - \alpha(u)) (1 - \sum_v q_{\theta}(v, u) x_{v,t-1})}\end{aligned}$$

- Given a multi-set $T = \{(u, z_u) | z_u \text{ units assigned to } u\}$, define $U(T) =$

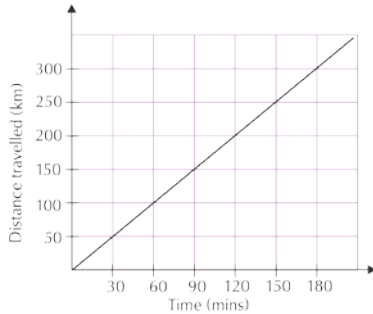
$$I_V^T \Delta \mathbf{x}_t = I_V^T \mathbf{x}_0 - I_V^T \mathcal{C}^t([x_{1,0}(1 - s_1(z_1)) \dots x_{n,0}(1 - s_n(z_n))])$$

- Theorem: $U(T)$ is submodular, and so greedy algorithm admits a $(1 - \frac{1}{e})$ -approximation
- Extend the approach to other issues

CS+SW: How to Make this Marriage Work

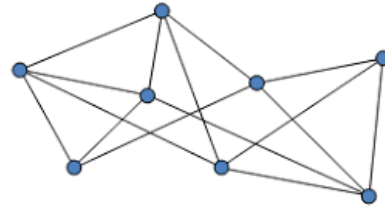
Overcome Language Barriers

Social Work

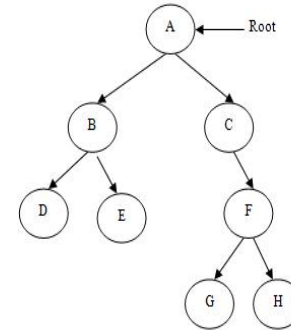


“Graph”

Computer Science



“Tree”



CS+SW: How to Make this Marriage Work

Identify Complimentary Strengths

Social Work

I have a list of problems to be addressed to improve society

I have real world data

I have domain expertise, valid/sensible assumptions

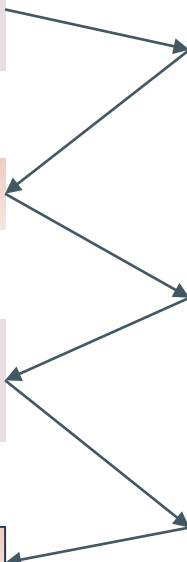
Real-world implementation

Computer Science

[Archimedes] Give me a place to compute and a large enough dataset and I will move the world ... w.h.p.

I have the optimal solution ... but it only works for spherical chicken in vacuum

I have the best possible solution based on the data and the assumptions



CS+SW: How to Make this Marriage Work



Get creative!

Explore different funding sources and resources!



Be passionate.

Find a social problem that you care about and a solution that you are **EXCITED** about and a team you get along with.



Stick with it.

Fields move at different paces. As junior scientists, we all have primary projects and work on this in our “extra” time.

The number 50 is written in a white, hand-drawn, brush-stroke style. Below the number are two horizontal, slightly curved white lines, suggesting a signature or a decorative underline.

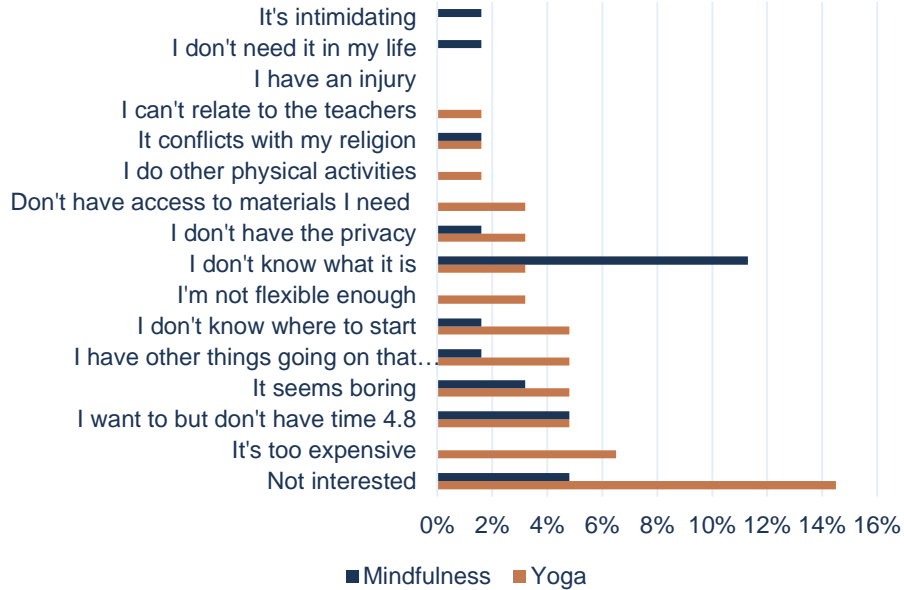
"MyPath is the middle before going to 0-100. It's that 50. Where you get to decide what you want to do. It means thinking before you react to something, not letting your emotions get the best of you, practicing that and making it a skill that you could practice throughout life."

- MyPath Mindfulness + Yoga
Ambassador

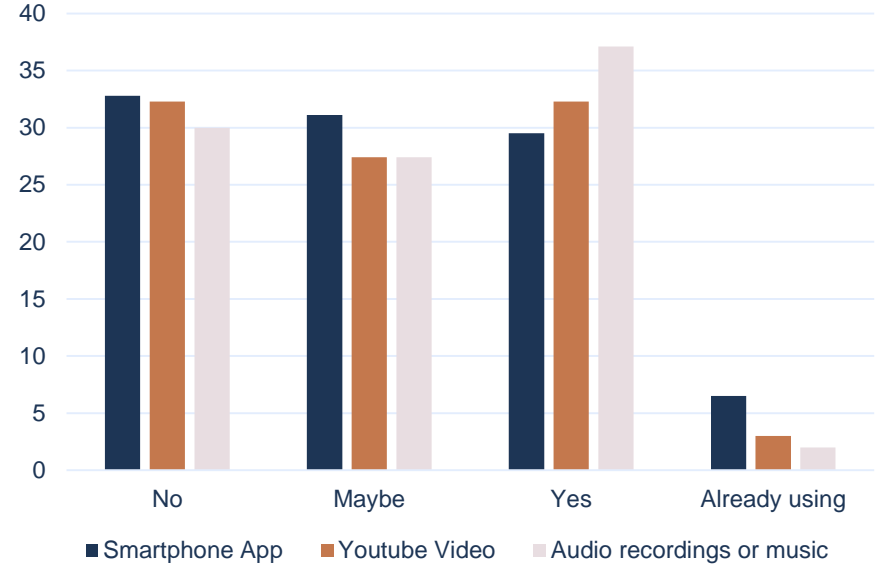
People think threatening and violence is the answer. If everyone did mindfulness we would be living in a semi-better world. I didn't know anything about mindfulness, all I did know was violence, how to protect myself. When I got to SPY, I learned mindfulness and learned how to relax myself with yoga. I feel like a different person when I do it.



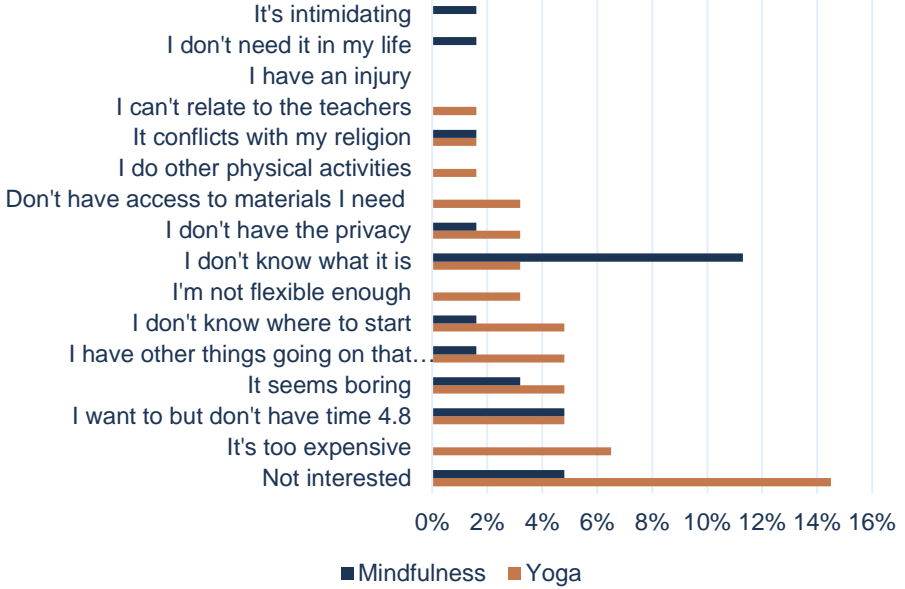
Reasons Not Practicing



Openness to Tools for Practicing



Reasons Not Practicing



Openness to Tools for Practicing

