

## Premise of project proposal

Previous studies of morality have relied on self-report measures to track changes in morality. Tracking autonomic responses in congruence with self-report measures offers more reliable data. Self-reported deontological responses in past research have shown stronger autonomic responses compared to that of utilitarian answers. Moral decision-making may elicit a physical response and thus changes can be tracked through measurements of autonomic responses. Some current methods of measuring autonomic responses to various situations and decision-making are tracking galvanic skin response, heart activity, and eye activity. These can be used as measures of autonomic nervous system activity and be used to distinguish changes in moral reasoning elicited through moral development exercises. Specifically, in the coming months we seek to develop the following aims:

**Aim 1** will determine optimal physiological measures that can be adaptively integrated into moral decision-making scenarios

**Aim 2** will utilize the eight key questions longitudinal moral intervention to examine whether prolonged directed moral reflection is sufficient to alter underlying non-conscious processes that guide decisions.

## Moral decision-making

### Historically used Measures of Morality

In previous studies, morality has been tracked through self-report measures. These measures are used for different situations depending upon the context. Self-report measures that are situation based often elicit a more emotional response than self-report measures that are non-situational (Giammarco, 2016). Situation based self-report measures include those that describe an event and ask the participant to act as a bystander in the dilemma. Non-situation based self-report measures have been seen to show more consistent results over time than situation based, however, they do not elicit a strong emotional response as they often pose rigid subjective questions. From self-report measures a participant's moral view is commonly categorized into two camps: deontological or utilitarian thinking.

### Deontology and Utilitarianism

Deontological thinking is the view that the morality of an action is dependent on the intrinsic value or nature of the action itself. This type of moral judgement has been associated with more emotion and reaction-based decision making. Brain imaging through fMRIs have shown when emotion centers are more active, deontological conclusions are more often reached (Greene, et al, 2001). Utilitarianism is the stance that the morality of an action is determined by the results of said action. This kind of moral judgement has been associated with slower, more methodological decision making (Suter and Hertwig, 2011). Cognitive areas in the brain have been seen to be more active during a utilitarian judgement as well, and (Greene, et al, 2001) more cognitive load on the participant while making a decision, has been associated with lower rates of cognitive thinking (Conway and Gawronski, 2013). This suggests Utilitarianism may require more cognitive brain functioning and rely less on emotions, while deontological thinking may reflect a more autonomic response as it is more associated with faster reaction-based decision making (Greene, 2007).

## Interventions in moral decision-making

Whether a participant engages in Deontological or Utilitarian thinking may reflect underlying non-conscious processes that influence decision-making pathways in the brain. To date, most neurophysiological examinations of morality have treated traits such as sympathetic activation as static features. However, ample evidence points to beliefs and other motivating stimuli to be subject to adaptation across the brain. For example, the activation of sympathetic responses when presented with morally salient scenarios varies from childhood to adulthood (Decety et al. 2012, Yucel et al. 2020). It is possible that the development of non-conscious somatic markers develop through maturation (Sandora & Gürvit, 2019), and further, that these can continue to be developed into adulthood. To date, this important question of whether moral interventions alter autonomic responses, and whether this correlates with changes in moral decision-making remains unclear.

## Methods of physiological responsiveness in decision-making

### Galvanic Skin Response (GSR)

- Method of measuring changes in sweat production
- GSR serves as an indicator of sympathetic nervous system arousal
- Somatic marker hypothesis suggesting that such responses help in decision making with (Damasio et al., 1990).
  - Patients with ventromedial Prefrontal cortex damage struggle to make appropriate decision in real life perhaps because of their failure to activate these somatic responses.
- Most people will produce an anticipatory GSR during the Iowa Gambling Task when contemplating risky decisions (Bechara et al., 1997)

### Heart Electrical Activity

- Electrocardiograph (ECG) is a proxy for peripheral nervous system arousal.
- Lower heart rate variability suggests limited integration of neuro-visceral systems which result in more utilitarian decision making (Park et al. 2016).
- Low-frequency Heart Rate Variability (HRV) is a measure as sympathetic activity.
- High-frequency HRV is a measure of parasympathetic activity.

### Eye – Tracking

- Cameras track eye movement, fixation, blink rate, and pupil size in response to various visual scenarios.
- Data can be used with software classifiers to organize and possibly predict or serve as a proxy of different individual traits.
- Berkovsky et al. (2019) found evidence that blink rates and pupil size were most useful in predicting personality traits.

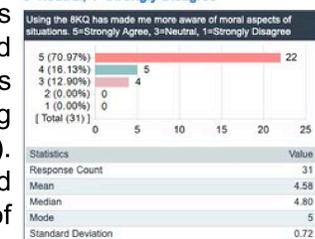
## Moral Intervention proposal

James Madison University has developed an acclaimed program aimed at equipping students and others to reflect on the moral domains of everyday decision-making. These questions are meant to bring ethical reasoning into everyday practice through reflection on the following questions applied to experiences participants have faced in the prior week:

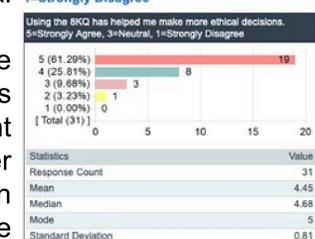
- **Fairness** - How can I (we) act justly, equitably, and balance legitimate interests?
- **Outcomes** - What possible actions achieve the best short- and long-term outcomes for me and all others?
- **Responsibilities** - What duties and/or obligations apply?
- **Character** - What actions help me (us) become my (our) ideal self (selves)?
- **Liberty** - How do I (we) show respect for personal freedom, autonomy, and consent?
- **Empathy** - How would I (we) act if I (we) cared about all involved?
- **Authority** - What do legitimate authorities (e.g. experts, law, my religion/god) expect?
- **Rights** - What rights, if any, (e.g. innate, legal, social) apply?

- Prior applications of the eight moral questions has demonstrated increased moral competency in students through a semester-long intervention (at right). Whether these self-reported changes are reflective of underlying changes in the wholistic experience of moral reasoning remains unknown.

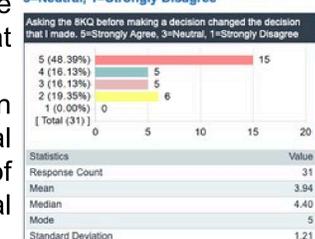
Using the 8KQ has made me more aware of moral aspects of situations. 5=Strongly Agree, 3=Neutral, 1=Strongly Disagree



Using the 8KQ has helped me make more ethical decisions. 5=Strongly Agree, 3=Neutral, 1=Strongly Disagree



Asking the 8KQ before making a decision changed the decision that I made. 5=Strongly Agree, 3=Neutral, 1=Strongly Disagree



- We are proposing to use the previously outlined methods of physiological measurement to determine whether prolonged interventions in moral reasoning using the eight key questions is sufficient to alter the unconscious processes that guide moral reasoning.
- Concerns about repetition effects on physiological measures and consistency of moral situations vs. external validity must be addressed.

- We hope to develop a methodology that enables us to measure changes in moral decision-making that can be correlated with any underlying physiological changes. Further, whether these changes can be reflected in decision-making processes outside of the controlled nature of the intervention will also be a key goal. We welcome feedback regarding methodology and implementation of moral reasoning that would be resistant to repetition effects and amenable to physiological measurement.