PSY405 Experimental Design Proposal

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Laboratory Debrief, June 2025

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Knowledge Landscape

Schadenfreude is defined as the experience of pleasure or delight derived from the misfortune of others (Heider, 1958)

Knowledge Landscape

$$\therefore SI_i := f(PU_{i,j,t-1} - PU_{i,j,t}) \text{ subject to } PU_{i,j,t} - PU_{i,j,t-1} < 0$$

Notation:

- SI_i: Schadenfreude intensity of i
- i: Person who experiences Schadenfreude
- j: Person who encounters misfortune
- t: Misfortune occurs
- $t-1$: Before misfortune
- $PU_{i,j}$ = Perceived utility of j from i's perspective

This equation follows most experimental setups in the Schadenfreude literature.

Knowledge Landscape

There exist many other factors that affect the intensity of Schadenfreude; however, we are focused on how the social status of i (ss_i) and j (ss_j) modulate the intensity of Schadenfreude.

From Feather, 1989; Van De Ven et al., 2014; van Dijk et al., 2019; van Dijk et al., 2011; Womick et al.; 2024:

$$SI_i := f(PD^{-}_{i,n}, ME_{i,q}, PT_{i,s}, AV_i)$$

Notation:

- $PD^{-}_{i,n}$: Perceived deservingness for negative outcomes from i's perspective in the space of object n, such that $\uparrow PD^{-}_{i,n} \implies \uparrow SI_i$
- $ME_{i,q}$: Malicious envy from i's perspective in the space of envy object q, such that $\uparrow ME_{i,q} \implies \uparrow SI_i$
- $PT_{i,s}$: Perceived threat from i's perspective in the space of object s, such that $\uparrow PT_{i,s} \implies \uparrow SI_i$
- AV_i: Assumptions of vulnerability from i's perspective, such that $\uparrow AV_i \implies \downarrow SI_i$

Knowledge Landscape

The level of perceived deservingness for negative outcomes from i's perspective in the space of object n is modeled as:

$$\mathrm{PD}^{-}_{i,n} := f\left(ss_{j,n}, \mathrm{sim}(a_j, o_j)\right) \text{ subject to } v_i(o_j) < 0$$

where:

- $ss_{j,n}$: Social status of individual j in the object space n, such that an increase in $ss_{j,n} \implies$ an increase in $PD^{-}_{i,n}$ v.v. (vice-versa) c.p. (ceteris paribus)
- a_j: Action vector of individual j
- o_j: Outcome vector for individual j
- v_i: Value function of i
- $\mathrm{sim}(a_j, o_j) := \frac{v_i(a_j) \cdot v_i(o_j)}{\|v_i(a_j)\| \, \|v_i(o_j)\|}$, such that an increase in $\mathrm{sim}(a_j, o_j) \implies$ an increase in $PD^{-}_{i,n}$ v.v. c.p.

Knowledge Landscape

The amount of malicious envy felt by individual i towards j with respect to the envy object q is modeled as:

$$ME_{i,q} := f\left(k \cdot \max(0, p_{j,q} - p_{i,q}), \mathbb{I}\{m_{i,q} = p_{j,q} - \alpha\},\ PD^{-}_{i,n}\right)$$

where:

- $p_{x,q}$: Position of x in the space of the envy object q
- k: Scaling factor
- $m_{x,q}$: Desired state of x in the space of the envy object q
- α: Positive constant
- $ME_{i,q}$ increases when $PD^{-}_{i,n}$ increases v.v. c.p.

Knowledge Landscape

However, there exist many different conceptualizations of ME_i that may be more salient to the practicing psychologist, where the underlying causal mechanisms are mentioned in a manner that enables greater generalizability across different situations (Lange et al., 2018). Perhaps I will focus on this topic for a potential PSY406. However, I wanted to constrain my analysis to the variables that were modified in previous experiments so as not to void my models.

Knowledge Landscape

In addition, perceived threat is modeled as follows:

$$PT_{i,s} := f\left(SeT_{i,s}, P_{j,s}\right)$$

where:

- $SeT_{i,s}$: Self-evaluation threat of i in the space of object s, such that an increase in $SeT_{i,s} \implies$ an increase in $PT_{i,s}$ v.v. c.p.
- $P_{j,s}$: Performance of j in the space of object s, such that an increase in $P_{j,s} \implies$ an increase in $PT_{i,s}$ v.v. c.p.

Please consider the possibility that $SelfEsteem_{i,s} = f(SeT_{i,s})$

Knowledge Landscape

We know that the perceived seriousness of the punishment on j and a general sense of justice modulates SI_i (Berndsen, 2016; Portmann, 2000; Portmann, 2014; Wang et al., 2019); therefore, we can view AV_i as a precursor to the aforementioned dimensions.

$$AV_i := f(PerceivedVulnerability_j)$$

Importantly, we predict that a decrease in $AV_i \implies$ an increase in SI_i v.v. c.p. assuming that the moral permissibility of SI_i, probed by AV_i, overlaps with SI_i

Knowledge Landscape

In addition, we control for individual-level fixed effects and other confounding variables on SI by accounting for:

- $\text{sim}(gender_j, gender_i) := gender_i \cdot gender_j$ (van Dijk et al., 2006)
- $DarkTriad_i$: Dark triad of i (Watts et al., 2017)
- $SelfEsteem_i$: Self-esteem of i (van Dijk et al., 2011)
- $DispositionalEnvy_i$: Dispositional envy of i (Smith et al., 1996)
- $JustWorldBelief_i$: Just world belief of i (Pietraszkiewicz, 2013)
- $PunishmentType_j$: Misfortune type of j (active/passive)
- $CloseToj_i$: How close i is to j
- $Likej_i$: How much i likes j (Van De Ven, 2015)
- $SIExhibitionCost_i$: Schadenfreude exhibition cost of i (Portmann, 2014)
- $CompetitionWithj_i$: How much i is competing with j (Ozkara, 2021)

Knowledge Landscape

With regards to data collection, our constructs will be measured in the following manner:

- SI_i: "I would enjoy what happened to that person", "I couldn't resist a little smile", "What happened to that person would amuse me", "I would be happy about what happened" (Van Dijk, Van Koningsbruggen, et al., 2011)
- $ME_{i,q}$: There exists a type of envy focuses more on the other person who holds the advantage (and typically includes a wish that the other did not have this advantage) "How much did you experience this type of envy which focuses on the other person and their advantage?" (Van De Ven et al., 2025)

Knowledge Landscape

- $PT_{i,s}$: "I am satisfied about my performance", "I believe that, in comparison with others, my performance was actually not that bad" (van Dijk et al., 2019)
- AV_i: "I believe that the following are especially vulnerable to being harmed", "I think that the following are especially vulnerable to mistreatment", "I feel that the following are especially vulnerable to victimization." (Womick et al., 2024)
- I decided to omit the confounding variable items as it is heavily debated whether we should include them in our experiment as there exists a heavy trade-off with cognitive load of i

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Landscape of the Unknown

Previous experiments have not attempted to determine when SI_i would increase given $ss_{i,n} > ss_{j,n}$ as an initial condition. From our model, we posit that a high $PT_{i,s}$ combined with a low AV_i would overthrow a low $PD^{-}_{i,n}$ where $n = s = q$, ultimately leading to an increase in SI_i c.p. ($ME_{i,j,q} = 0$). In addition, we would like to test whether this relationship holds true when $n \neq s \neq q$. We are also interested in the self-rated moral permissibility of SI_i.

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Experimental Design

To test this prediction, we propose an experimental design with the following steps:

- Step 1: i completes an game where the outcome is socially relevant. This method will define $ss_{i,n}$. We will use Raven's Progressive Matrices, as they are strongly indicative of general intelligence (Deary and Smith, 2004), a socially relevant trait. In addition, to ensure that our participants are emotionally invested in this experience, we will provide them with monetary compensation proportional to the number of correct answers submitted. i learns about the general population's performance, such that $(ss_{gp} > ss_i \vee ss_i > ss_{gp})$.
- Step 2: i learns about j's performance in the same game, defining $ss_{j,n}$. j's performance is predetermined $(ss_j > ss_i \vee ss_i > ss_j)$.
- Step 3: Collect $PT_{i,s}$, $Likej_i$, $Closej_i$, AV_i and $ME_{i,q}$

Experimental Design

- Step 4: i learns that j completed a similar variant of this game, but encountered a decrease in performance after putting in (High $\vee$ Low) amounts of effort
- Step 5: Collect SI_j and i's self-rated moral permissibility of SI_j
- Step 6: Collection of data pertaining to individual-level fixed effects and confounding variables ($DarkTriad_i$, $DispositionalEnvy_i$, $JustWorldBelief_i$, $SIExhibitionCost_i$, $CulturalFactors_i$)

Experimental Design

We will enable greater tightness of constraints by:

$$n = s = q$$
$$\implies p_{j,q} = ss_{j,n} \wedge p_{i,q} = ss_{i,n}$$

In addition, we will ensure that $\text{sim}(gender_j, gender_i)$ holds true for all conditions. Finally, we will ensure that $PunishmentType_j$, $CloseToj_i$, $Likej_i$, and $CompetitionWithj_i$ remains constant for all conditions

Experimental Design

For our game, we will use 20 Raven's Matrices items, ranging from easy to difficult, where, for each correct answer, the participant will receive an additional 0.25$ in compensation.

For the setback, all j's will encounter a performance decrease of 5 units.

All in all, we will have a 2x2x2 factorial design.

Thoughts

Maybe mind perception strongly underlies SI_i?

Maybe we should have setback $\notin$ object n

Maybe we should have a manipulation for AV_i

Statistical Analyses

We plan to use multilayer neural networks, multiple linear regressions, regression trees, random forests, KNN, PCA, and PySR in addition to the aforementioned functional form to model our data.