IL-1β Activity Predicts Investment in Present Versus Delayed Outcomes

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- Life history theory predicts that individuals living in environments with a relatively high extrinsic mortality risk will favor more immediate reproduction and an enhanced preference for present versus future rewards (Stearns, 1992; Kaplan & Gangestad, 2005).
- Individuals' life history strategies should also be calibrated to internal cues bearing on one's somatic condition, which also plays an important role in determining one's mortality risk (Rickard, Frankenhuis, & Nettle, 2014).
- Interleukin-1 beta (IL-1β) is a proinflammatory cytokine that plays a key role in regulating local and systemic inflammatory processes after injury and immune challenge (Dinarello, 2011) and is involved in the body's response to both physical and psychosocial stressors (Goshen & Yirmiya, 2009).
- We predicted that IL-1β may be a key internal marker of somatic condition, playing an important role in decisions about how much to invest in immediate versus delayed outcomes, both at the behavioral and cellular level.

Analysis 1

- We examined the relationship between serum IL-1β levels and investment in present versus delayed outcomes.
- Participants provided answers to Delaying Gratification Inventory (DGI; Hoerger et al., 2011), Mini-K (Figueredo et al., 2014), Future Orientation scale (FO; Steinberg et al., 2009), and Barratt Impulsiveness Scale (BIS; Patton et al., 1995).
- We predicted that higher levels of serum IL-1β would be associated with temporal discounting and an overall faster life history strategy.

Correlations Between IL-1β and Focus on Present Outcomes

	Serum IL-1β	Mini-K	BIS-11	Delayed Gratification
Future Orientation	-.34*	.43***	-.58***	.49***
Delayed Gratification	-.37**	.48***	-.56***	
BIS-11	.42**	-.49***		
Mini K	-.21			

Note. $*p \leq .05$, $**p \leq .01$, and $***p \leq .001$

Results

- Serum IL-1β was related to a more present focus, inability to delay gratification, and greater global impulsivity. The relationship between serum IL-1β and a faster life history strategy as measured by the Mini-K was trending towards, but did not reach significance ($p = .17$).

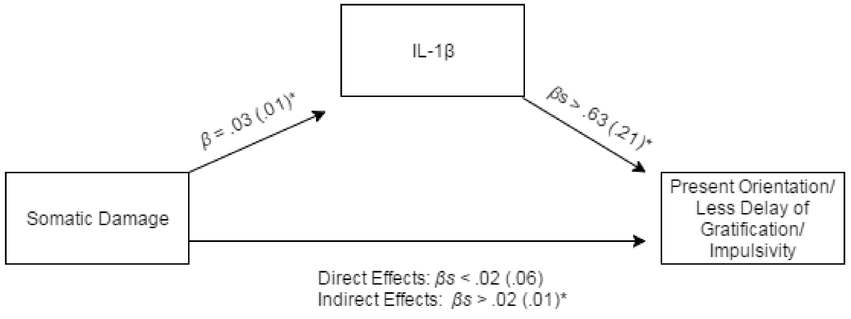
We next sought to explore if characteristics known to negatively impact somatic condition would predict serum IL-1β levels, leading to a preference for present outcomes.

Analysis 2

- Guided by previous literature, we selected five established somatic stressors as predictors of IL-1β activity:
  - Body Mass Index (BMI; Flegal et al., 2013)
  - Childhood Stress (Simmons & Bernstein, 1982)
  - Adult Stress (Prior et al., 2016)
  - Childhood Illnesses (Bozzoli et al., 2008)
  - Adult Illnesses (Klevens et al., 2007)
- Individually, none of these predictors were significantly correlated with serum IL-1β levels ($ps > .21$).
- The allostatic load literature, however, describes the cumulative effect of environmental stressors on the body (e.g., see Schulkin, 2004). With this in mind, we computed a summative somatic damage composite using Z scores of each variable listed above so that a higher score would represent greater somatic stress.

Results

- We found that our cumulative allostatic load variable predicted investment in present over future outcomes, mediated through increased serum levels of IL-1β.

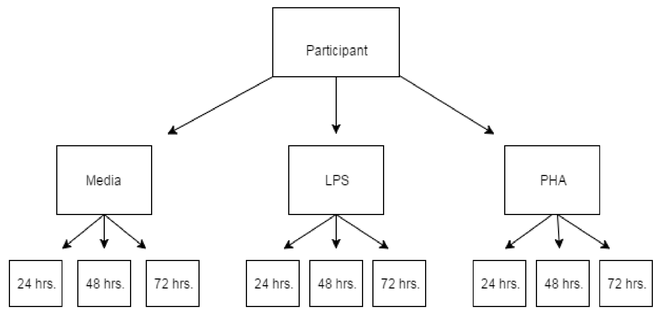


Analysis 3

- We next looked to explore if the relationship between IL-1β would remain after controlling for these sources of somatic stress.
- After controlling for all of these variables, the relationship between serum IL-1β and all measures of preference for investment in present outcomes (DGI, FO, & BIS) holds ($ps < .03$).

Additional Preliminary Analyses

- We have preliminary data suggesting that factors harmful to somatic condition individually predict elevated release of IL-1β by peripheral blood-derived mononuclear cells (PBMCs) *in vitro*. Please ask the presenter for additional information.



Discussion and Future Directions

- Serum IL-1β predicts investment in present over delayed outcomes. Consistent with the prediction that IL-1β is a marker of one's somatic condition, factors known to negatively impact bodily health together predict levels of serum IL-1β.
- The relationship between serum IL-1β and investment in the present remains after controlling for antecedents to somatic damage. Previous literature has suggested that the role of internal and external factors in determining IL-1β-related outcomes might be moderated by variants of the *IL1β*, which warrants further investigation (Baune et al., 2010).
- It appears that the ability for elevated serum IL-1β to promote present temporal focus exhibits a path independence, such that the primary effect of IL-1β on preference for present outcomes is not sensitive to the factors which determine its rise.

Selected References

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