**The association between loneliness, social cognitive processes, and parasympathetic activity in young adults.**

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## Abstract

Perceived social isolation, also known as loneliness, is an experience characterized by feelings of a lack of social connectedness and support, which significantly increases the risk of psychiatric disorders, cardiovascular disease, and all-cause mortality. The Evolutionary Theory of Loneliness (ETL), currently the dominant theoretical paradigm in the field of loneliness research, proposes that these adverse health outcomes result from increased hypervigilance to social threats associated with a prolonged fear of experiencing hostility from others. It can be hypothesized that such increased sensitivity to negative social cues may translate into maladaptive changes in the parasympathetic response, as measured by heart rate variability (HRV), both at rest and in response to social stimuli. At the same time, it is not clear what exact mechanisms might underlie the detrimental physiological sequelae of perceived social isolation and how distinct temporal scales of loneliness (i.e., momentary feelings versus a chronic pattern of functioning) contribute to these effects.

The presented series of studies aimed to investigate the social cognitive and parasympathetic correlates of different types of loneliness in young adults: experimentally induced loneliness, momentary loneliness measured in real life, and chronic loneliness assessed with standardized psychometric questionnaires. We hypothesized that (1) all three types of loneliness would be associated with increased social cognitive bias, i.e., a tendency to perceive others more negatively; (2) both experimentally induced and chronic loneliness would be related to indices of decreased parasympathetic activity; and (3) social cognitive bias would underlie the relationship between loneliness and decreased parasympathetic activity.

To test these hypotheses, we used data from (1) a laboratory study (N = 119) employing physiological measurements and an experimental manipulation to invoke a transient sense of loneliness or belonging, during which participants completed a social information processing task; (2) two experience sampling studies, one exploratory (N = 64) and one pre-registered (N = 103) designed to compare how momentary and chronic loneliness are associated with perceptions of real-life situations; and (3) two cross-sectional studies, one examining the relationship between chronic loneliness, social cognitive capacity, and social cognitive bias

using a clinically-oriented battery of tests with established psychometric properties (N = 252), and the other exploring the association between chronic loneliness, parasympathetic activity measured at rest, and social cognitive and psychopathological factors potentially contributing to this relationship (N = 325).

In line with the ETL, the experience sampling and cross-sectional studies demonstrated increased negative social appraisals and social cognitive bias related to higher levels of momentary and chronic loneliness. Furthermore, the studies including physiological measurements showed that decreased parasympathetic regulation can result from the experimental loneliness induction and is related to poorer perceived social functioning, although the latter association was significant only in men. At the same time, across studies, we found evidence for a generalized, domain-independent negativity bias rather than a specific pattern of response to social information processing in lonely individuals: experimental induction of loneliness increased negative affect, but not negative ratings of social stimuli; in the experience sampling studies, both momentary loneliness and high levels of chronic loneliness were related to more negative and less positive appraisals of both social and non-social situations; finally, results of the cross-sectional study showed that the association between chronic loneliness and decreased parasympathetic function is mediated by depressive symptomatology, and not by specific social cognitive biases.

The findings of the presented cycle provide evidence for the association between different types of loneliness and increased social cognitive biases, as well as for the relationship between loneliness (experimentally induced and chronic) and decreased parasympathetic function. However, these two mechanisms were not directly linked, and instead the maladaptive physiological effects of perceived social isolation seemed to be related to increased general negative affectivity and depressive symptomatology, rather than social cognitive mechanisms. Thus, the presented series of studies offers important insight into potential targets for future interventions and individual factors moderating the effects of loneliness on negative health outcomes in young adults.

*Keywords*: loneliness, social cognition, parasympathetic activity, social cognitive biases, young adults