

# Visual attention as a predictor of callous-unemotional traits and helping behavior in youth

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While psychopathy is rare, callous-unemotional (CU) traits, a precursor to psychopathy, are more common across the population (Coid et al., 2009). As children develop, they increasingly engage in prosocial behaviors, such as helping and sharing (Brazil et al., 2022), yet individual variation exists. In adults, these differences are linked to interpersonal emotional traits such as empathy and CU traits, which influence not only prosocial actions but also antisocial behaviors, such as defying authority, causing harm, or engaging in violence (Kimonis et al., 2014). Adults with psychopathic traits show attentional differences, particularly reduced eye contact, which has been associated with impairments in social cognition (Kaseweter et al., 2020). Aversion to others' eyes during social interaction is observed in criminal offenders (Gehrer et al., 2020). Although adult antisocial behavior has been well studied (Neumann et al., 2015), less is known about its developmental origins. Middle childhood, a sensitive developmental period of expanding social awareness (Mah & Ford-Jones, 2012), remains underexamined. With this project, I explored the intersection of interpersonal emotional traits, visual attention, and prosocial behavior in this key developmental stage.

Infants' visual attention to social agents has been extensively studied. One prominent paradigm used looking time to assess infants' preference for social actors (Hamlin et al., 2007), showing that infants preferred watching helpful agents over hindering ones and reached toward the prosocial character. Although replication efforts yielded mixed results (Lucca et al., 2024), longitudinal work found that early prosocial preferences predict fewer CU traits and better social skills in preschool (Tan et al., 2018). However, little is known about how these preferences develop beyond infancy, especially in middle childhood, a key developmental period marked by increasing autonomy, social engagement, and sensitivity to social norms (Knafo-Noam et al., 2024). This study addressed that gap by testing how children's eye gaze toward social agents and their behavior in a prosocial task are associated with CU and empathic traits in middle childhood. I tested three hypotheses: H1: Building on Tan and colleagues (2018), increased looking time toward prosocial agents would predict lower CU traits. H2: Further extending Tan et al. (2018), looking time toward helpers would predict higher empathy. H3: Given past associations with prosocial behavior, higher CU traits would predict reduced helping behavior.

## **PARTICIPANTS**

Initially, I aimed to recruit a sample of 200 children aged 8–12. However, delays and obstacles in recruitment and funding, as well as staffing constraints, limited the number of completed data collection sessions, resulting in a sample of 75 participants at the time of drafting this report. Furthermore, quality issues in the eye-tracking data reduced the sample to 56 participants ( $M_{\text{age}} = 11.01$ ,  $SD = 1.19$ ); eye-tracking data loss is a known issue in child samples (Hessels & Hooge, 2019).

## **METHODS**

Child participants completed an eye-tracking task adapted from Hamlin et al. (2007) and a computer-based prosocial game, allowing quantification of helping behavior. Children completed the 28-item Interpersonal Reactivity Index (IRI; Davis, 1983) to assess individual reactions to another's observed experiences. Children also completed the 24-item Inventory of Callous-Unemotional Traits in Youth (ICU-Y; Essau et al., 2006) to assess CU traits. Both IRI ( $\alpha = .77$ ) and ICU-Y ( $\alpha = .78$ ) had acceptable reliability for inclusion in the analyses.

During the eye-tracking task, participants were instructed to remain still while viewing animated sequences adapted from Hamlin and colleagues (2007), presented as a 17-second animated clip on a desktop monitor equipped with an eye tracker. The task began with a circle-shaped character with eyes attempting to climb a hill but sliding down after two failed attempts. A second character (a square or triangle) entered, pushed the climber up or down the hill, helping or hindering its goal, then exited the frame. The three helping and three hindering action trials were counterbalanced across sessions, with each participant viewing six trials in total. Gaze data were processed using dynamic areas of interest (AOIs) defined around the helper, hinderer, and climber (helped or hindered), and Tobii Pro Lab software was used to determine on-screen gaze time directed at a moving area. Total gaze time toward each AOI was averaged across trials and calculated as gaze proportion by dividing AOI-type gaze time by the total on-screen looking time when each AOI was visible.

Participants then engaged in the computer-based Zurich Prosocial Game (ZPG; Leiberg et al., 2011). They were told to reach an on-screen treasure as quickly as possible, within one minute, by navigating a path using mouse clicks. Participants were deceptively informed that they were playing along with another person online, matched with a new player each round; the other player's actions were pre-programmed (CPU) and varied across trials, providing or withholding help. Although players could reach their respective treasures, both could win in the same round. Each round began with players choosing between two paths, making the unselected pathway inaccessible. Players moved by clicking on arrows near their avatar. As the game progressed, color-coded gates blocked on-screen paths. The in-game panel showed which gates might appear and which keys each player possessed for the round. Players could open gates by clicking on color-matched keys. Using a key removed it from their inventory and opened a gate for their path or their partner's, depending on how they chose to use them. Each player could use their keys independently of the paths the gates occupied, enabling them to open gates that impeded the other player's progress. If a player was blocked for more than five seconds, they could not advance and would fail to reach the treasure, but could still use any remaining keys.

## ANALYSES

Descriptive statistics and bivariate correlations are shown in Table 1. A paired-samples t-test revealed a significant difference in the proportion of looking time, with children allocating more visual attention to the hinderer ( $M = 0.10$ ,  $SD = 0.03$ ) than to the helper ( $M = 0.07$ ,  $SD = 0.02$ ),  $t(55) = -8.71$ ,  $p < .001$ .

To evaluate my first (H1) and second (H2) hypotheses, I fit separate multiple linear regression models to examine whether looking time predicted CU and empathic traits, respectively, accounting for age. The regression model assessing my first hypothesis showed no significant effect ( $\beta = 0.025$ ,  $SE = 0.133$ ,  $p = .853$ ). My second hypothesis was also unsupported ( $\beta = -$

0.148,  $SE = 0.142$ ,  $p = .298$ ). To evaluate my third (H3) hypothesis, I fit an additional multiple linear regression model to assess whether CU traits predicted helping behavior during the ZPG; this prediction was also unsupported ( $\beta = 0.023$ ,  $SE = 0.131$ ,  $p = .858$ ).

However, exploratory analyses revealed noteworthy findings. While no effect was found when exploring the association between CU traits and the helped climber ( $\beta = -0.127$ ,  $SE = 0.136$ ,  $p = .355$ ), I did find a negative association between CU traits and the hindered climber ( $\beta = -0.286$ ,  $SE = 0.131$ ,  $p = .034$ ), such that as the proportion of looking time toward the hindered climber increased, CU traits decreased. Parallel analyses assessing associations with empathy were non-significant for the helped climber ( $\beta = 0.176$ ,  $SE = 0.146$ ,  $p = .236$ ) and the hindered climber ( $\beta = 0.186$ ,  $SE = 0.149$ ,  $p = .217$ ).

## CONCLUSION

The study was underpowered to make any generalizable claims and should be considered preliminary. To date, the data suggest no such hypothesized associations between looking time toward social actors, interpersonal emotional traits, and helping behavior. One possible explanation for the null findings is that the stimuli may not elicit a strong enough response from older children. The paradigm is adapted from a simplistic design intended for infants and young children, and because older children are typically more socialized, they may find the interactions less novel or captivating. Similarly, the gamification of helping behavior in the ZPG may create an environment unfamiliar to some children (e.g., one participant commented that they did not play video or computer games and had a hard time monitoring the information displayed, including time, resources, and remaining obstacles, while moving their character).

Regarding the increased looking time toward the hindering actor, allocating attention to behaviors that may pose a danger or block progress toward goals may be advantageous. Gaze proportion toward the hinderer aligns with the negativity bias evidenced in other avenues of research, suggesting that negative information about the environment is more salient and richer than positive information (Baumeister et al., 2001; Norris, 2021; Rozin & Royzman, 2001). This negativity bias effect has been observed in early childhood alongside an emerging prosocial preference (Vaish et al., 2008) and may carry into middle childhood.

My exploratory analyses show a negative association between CU traits and looking time toward the hindered climber, possibly reflecting compassion for victims. While preliminary and exploratory, this finding is consistent with the existing literature, as those with fewer CU traits may be more inclined to feel compassion toward someone facing what they perceive as an injustice (Camara et al., 2025). Children high in CU traits often fail to recognize when others are in need or to offer help when it is warranted (Paz et al., 2024). Recent evidence suggests that elevated CU traits are associated with reduced gaze cueing to social cues and poorer recognition of emotion (Bedford et al., 2021; Dawel et al., 2015). However, this association was not observed for empathy, contrary to expectations (Urbanska et al., 2019).

Table 1. Descriptive statistics and correlations of study variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Age	11.01	1.19							
2. Helper gaze proportion	0.07	0.02	-.04 [-.30, .23]						
3. Hinderer gaze proportion	0.10	0.03	.06 [-.20, .32]	.48** [.25, .66]					
4. Helped climber gaze proportion	0.32	0.05	.08 [-.18, .34]	-.36** [-.57, -.10]	-.40** [-.60, -.15]				
5. Hindered climber gaze proportion	0.31	0.06	-.08 [-.33, .19]	-.09 [-.34, .18]	-.57** [-.72, -.36]	.76** [.63, .85]			
6. Empathy (IRI)	58.96	13.70	-.07 [-.34, .22]	-.15 [-.41, .14]	-.13 [-.40, .16]	.18 [-.11, .44]	.19 [-.10, .45]		
7. CU traits (ICU-Y)	19.57	7.75	.10 [-.16, .36]	.02 [-.24, .28]	.14 [-.13, .39]	-.12 [-.37, .15]	-.29* [-.52, -.03]	-.44** [-.64, -.18]	
8. Helping (ZPG)	3.88	2.46	.23 [-.04, .46]	.01 [-.25, .27]	.08 [-.19, .34]	.13 [-.14, .38]	.02 [-.25, .28]	-.09 [-.37, .20]	.05 [-.22, .31]

*Note.* *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .