Initially we predicted that higher levels of adversity—especially violence exposure—would be associated with a present-oriented attention style. We expected such an attention style to be associated with faster attention to subtle changes and peripheral information, but also with lowered inhibition. Generally speaking, the results of the first two studies were not in line with these predictions. Instead, the Flanker findings suggest that both violence exposure and environmental unpredictability are associated with lowered perceptual input, but is not associated with changes in attention. These findings are intriguing as they suggest that performance differences are not driven by differences in interference control—which is typically assumed. While interesting, these findings so far leave open the question why perceptual input is negatively associated with perceptual input.

First, it may indicate a deficit in processing information. Note that this explanation would be different from typical interpretations of lowered Flanker performance, which typically equate lower performance (i.e., longer RTs) with lowered inhibition ability. Instead, a deficit in processing information is a different pathway to lowered performance: it implies that people from adversity are completing the task with lower-quality information—akin to when the arrows would be more blurry. Alternatively, the difference in perceptual input may not be a cognitive deficit per se, but instead could be a signature of a difference in processing style. People from adversity may process information more holistically, focusing more on the whole instead of individual pieces of information. On a task like the Flanker, this would lower the depth of perceptual processing of any individual stimulus, thus potentially explaining the pattern of results in the previous two studies. In study 2, our aim is to replicate the central Flanker findings of the pilot study and study 1 (lowered perceptual input but no differences in interference), and to investigate whether adversity would be associated with a stronger tendency to process information holistically on a Global-Local Task.

## Primary aims

1. Investigate how unpredictability and violence exposure are associated with perceptual input and interference on the Flanker Task by pooling the data across all three studies.
2. Investigate how unpredictability and violence exposure are associated with a preference for more holistic vs. detailed processing of information.

# Methods

## Participants

Participants will be 400 US-based individuals between the ages of 18 and 30. Recruitment will be identical to study 1. We conducted a power analysis for the planned linear regressions through simulation. We determined the required sample size to achieve power of > .90 for a standardized main effect of 0.05. This main effect is slightly lower than the effect of 0.06 that we found for perceptual input in the pooled analyses of study 1. Simulations revealed that we would require around 450 participants to achieve a power of .93. We decided to recruit 500 participants with the expectation that we will have to exclude around 50 participants.

## Exclusion criteria

Participants will be excluded if they 1) do not complete the full study or both cognitive tasks, 2) miss both attention check items or if they have suspicious response patterns (e.g., consistently endorsing high response options even when some items were reverse coded), 3) have a screen height < 700 pixels or a screen height that is bigger than the screen width to ensure the tasks were completed on a laptop or desktop pc, 4) exit full-screen mode and/or engaged with other browser tabs *during* the cognitive tasks (but not while reading instructions or while taking breaks in between blocks), 5) do not perform above chance on either the Flanker Task or the Global-Local Task (based on a binomial distribution using a probability of 97.5%).

In addition, we will screen reaction times on both cognitive tasks. We will remove trials with response times < 250 or > 3500 ms. Participants with more than 10 removed trials will be excluded from the analyses.

## Measures

We provide brief summaries of measures that were unchanged between study 1 and the current study 2. See the appendix for a full overview of all questionnaires.

### Flanker Task

The Flanker Task is identical to the standard version used in study 1. It was programmed in JsPsych 7.3.2 (**deleeuw\_2015?**). Participants first complete eight practice trials and next completed 64 test trials in a single block.

## Global-Local Task

The Global-Local Task is a measure of global-local processing (**navon\_1977?**). Many different versions of the task exist in the literature. One key dimension is whether the tasks measures focused attention (by cueing attention towards the global or local level prior to stimulus presentation) or divided attention (by having participants search for a target on both levels) (**lee\_2023?**). Here, we use a version measuring divided attention, which allows measuring a natural preference for either global or local processing [(**hakim\_2016?**); lee\_2023; (**mckone\_2010?**)].

Participants are presented with images of big letters (the global level) that are comprised of small letters (the local level)—so-called Navon images (**navon\_1977?**). On each trial, participants are instructed to find one of two target letters—an ‘E’ or ‘H’—and indicate whether the target letter was present on the global or local letter by pressing ‘g’ or ‘l’ on their keyboard, respectively. Stimuli consisted of all combinations of the letters ‘T’, ‘F’, ‘P’, ‘L’, ‘H’, and ‘E’, with ‘H’ and ‘E’ present in each stimulus. Each stimulus was .. pixels high and .. pixels wide and comprised of seven local letters vertically and five local letters horizontally. The global and local level never contained the same letter. Participants first completed eight practice trials, after which they completed an additional 64 test trials. The main outcome measure is mean response time and accuracy for global targets and local targets separately.

### Current state

We will assess state anxiety during the experiment using the state subscale of the State-Trait Anxiety Inventory [Stai-S; (**speilberger\_1999?**)] (See [Table S1](#appendix)). An overall state anxiety variable was computed by averaging across the 20 unweighted items.

### Violence exposure

Violence exposure will be measured using two measures: 1) the Neighborhood Violence Scale [NVS; Frankenhuis & Bijlstra (2018); Frankenhuis et al. (2020)] (see [Table S2](#appendix)) and 2) two items assessing exposure to physical fights before age 13 (“Based on your experiences, how many times did you see or hear someone being beaten up in real life, before age 13?” and “How many times were you in a physical fight, before age 13?”). A violence exposure composite score will be calculated as an unweighted average of the mean NVS score (standardized) and the mean of the fighting items (standardized).

### Unpredictability

We distinguish between subjective and objective measures of environmental unpredictability. Subjective unpredictability will be measured as an unweighted average of three scales: 1) A scale of perceived childhood unpredictability used in previous research (see [Table S3](#appendix)) (Mittal et al., 2015; Young et al., 2018); 2) An adapted version of the Confusion, Hubbub and Order Scale [CHAOS; Matheny et al. (1995)] (see [Table S5](#appendix)); 3) An adapted version of the Questionnaire of Unpredictability in Childhood [QUIC; Glynn et al. (2019)] (see [Table S4](#appendix)). Objective unpredictability will be measured as an unweighted average of four items relating to experiences prior to age 13: 1) number of residential changes, 2) number of male and female romantic partners of a caregiver besides the other primary caregiver (measured separately; values > 6 were given a value 6 to prevent extreme outliers), 4) self-reported stability of the family and social environment across four dimensions: economic status, family environment, childhood neighborhood environment, and childhood school environment (rated between 1 (the same all the time) and 5 (constant and rapid changes)). The main analyses will be based on a full composite that is an unweighted standardized average of subjective and objective unpredictability.

### Poverty exposure

We will create a poverty composite score that is the average of the following measures (standardized) focusing on the family situation prior to age 13: 1) perceived level of resource scarcity (See [Table S6](#appendix)); 2) the unweighted average of the highest achieved education of both primary caregivers; 3) household income (6-point scale: ‘less than $ 25k/year’, ‘$25k - $49k/year,’$50 - $74k/year’, ‘$75 - $99k/year’, ‘$100 - $149k/year’, ‘more than $150k/year’. Scores were reverse coded so that higher scores indicated higher levels of poverty.).

### Attentional style

We will measure attentional style using the Attentional Style Questionnaire [ASQ; (**calster\_2018?**)]. The ASQ measures self-reported attentional style, with seven items asking about the participant’s propensity for internally oriented attention (e.g., “During an activity, unrelated mmental images and thoughts come to my mind”) and seven items about externally oriented attention (e.g., “I am easily drawn to new stimuli (for example, voices of people passing by, as sound in the house, …) that are not relevant to a task I am doing”). Where necessary, items were recoded in such a way that they reflected *distractibility* by internal and external stimuli, respectively, with higher scores reflecting a higher degree of distractibility. We will compute unweighted averages separately for internally oriented attention and externally oriented attention.

### Impulsivity

We will measure impulsivity with the Motor Impulsivity subscale of the Barrett Impulsivity Scale (BIS; short form; (Patton et al., 1995; Spinella, 2007)) (See [Table S7](#appendix)) An overall impulsivity variable will be computed by averaging the five unweighted items.

### Future Orientation

We will measure future orientation with an adapted version of the Future Orientation Scale [FOS; Steinberg et al. (2009)] (See [Table S8](#appendix). An overall future orientation variable will be computed by averaging the 15 unweighted items.

### Depressive symptoms

We will measure depressive symptoms during the past week using the Center for Epidemiologic Studies Depression Scale [CESD; Radloff (1977)] (See [Table S9](#appendix). An overall depression variable will be computed by averaging the 20 unweighted items.

## Procedure

The experiment will be completed on the participants’ own laptop or desktop computer and will of five parts (in fixed order): consent, cognitive tasks, questionnaire battery, brief demographics form, and final checks including the opportunity to give feedback on the experiment. Participants are allowed to refrain from answering any of the questionnaire items, but are prompted with a warning once when moving to the next page if one of the items is not answered (which they can ignore).

After providing consent, participants start either with the Flanker Task or Global-Local Task (counterbalanced). They are asked to complete the tasks in a quiet room in the house where they would be least likely to be distracted by other people or outside noises. At the onset of the first task, the experiment switches to full-screen mode to limit distractions from other programs or browser tabs. The size of the task stimuli is controlled between subjects using the resize plugin in JsPsych (Leeuw, 2015). After successfully resizing the screen, participants complete all three tasks. Code for the three tasks can be found at <https://github.com/StefanVermeent/attention_project/tree/main/preregistrations/3_study2/materials>.

After completing the cognitive tasks, participants complete the questionnaire battery in the following fixed order: 1) Current state (state anxiety and separate questions relating to specific states); 2) Childhood adversity (perceived unpredictability, perceived socio-economic status, exposure to violence and physical fights, household chaos); 3) Temporal orientation (impulsivity, future orientation); 4) Depressive symptoms.

Finally, the demographics questions asks about the participant’s age, weight, height, physical activity, sex at birth, gender, ethnicity, social class (current and during childhood), education level (one’s own as well as caregivers’ education level), occupation, and household income (current and during childhood). At the end of the experiment, we ask participants if they ever got up or were interrupted during the study, and how noisy their environment was during the attention tasks.

The full experiment is expected to take approximately 30 minutes. Participants are paid £3.75 upon completing the full experiment.

## Data analysis

### DDM estimation

For the Flanker Task, we will use the Shrinking Spotlight Model [SSP; Grange (2016); White et al. (2018); White & Curl (2018); White et al. (2011)] to fit the data. The SSP model will be fit to the data of each individual participant in two steps. First, we loop over 50 different sets of starting parameters with a variance of 20 to find the best starting values for each participant.  
On this first fitting step, 1000 trials will be simulated on each iteration of the fit routine. Second, after finding the optimal set of starting values, we fit the final model using the best starting values found in step 1 and simulate 50,000 trials on each iteration. The main parameters of interest are perceptual input (*p*) and interference (initial attention width / attention shrinking rate).

For the Global-Local Task, we will use an hierarchical Bayesian DDM to fit the data using the runjags package (**denwood\_2016?**). Drift rate and non-decision time will be freely estimated per task condition (global vs. local), whereas boundary separation wil be fixed to be equal across conditions. The starting point will be fixed to 0.5. Each model will be fit with three Markov Chain Monte Carlo (MCMC) chains. Each chain will contain 2,000 burn-in samples and 10,000 additional samples. Of these samples, every 10th sample will be retained. Posterior samples of all three chains will be combined, resulting in a posterior sample of 3,000 samples. The main parameter of interest is the drift rate, more specifically, the difference between drift rates (drift rateglobal - drift ratelocal).

### Primary analyses

To address the [first primary aim](#primary), we will fit a linear regression model to the pooled data of all three studies (i.e., the pilot study, study 1, and study 2). We will fit different models for environmental unpredictability and violence exposure as predictors (using the respective composite scores) and for perceptual input and interference as dependent variables. Each model will additionally contain the following covariates: study number (…), whether participants rescaled their screen at the start of the cognitive tasks (yes or no, sum-coded), whether participants experienced interruptions during the tasks (yes or no, sum-coded), and whether people exited full-screen mode during the experiment (yes or no, sum-coded). Note that the latter three covariates were included as arbitrary decisions in the multiverse analyses for the pilot study and study 1. However, as we found that they substantially altered the results, we decided to reclassify them as non-arbitrary decisions and include them as covariates instead. To address the [second primary aim](#primary), we will fit the same model as described above for the first primary aim, but with the difference score of the Global-Local drift rate as the dependent variable.

### Multiverse analysis

We will conduct a multiverse analysis for all primary analyses. We identified seven arbitrary analytic decisions, including or excluding 1) participants who had a recaptcha score below 0.5 (possibly indicating bots); 2) participants who did not enter fullscreen mode prior to starting the cognitive tasks; 3) participants who indicated high levels of noise in their environment. For each analysis, we report the median , 95% confidence intervals, proportion of *p*-values < .05 across all analytic decisions. For the primary analyses, we used a bootstrapping technique to compute overall *p*-values to assess whether the obtained median is significantly larger than zero (Simonsohn et al., 2020).

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# Appendix

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Table 1. Items of the State-Trait Anxiety Inventory (state subscale; STAI-S)

| Item |  | Description |
| --- | --- | --- |
| 1 |  | I feel calm. (recoded)\* |
| 2 |  | I feel secure. (recoded)\* |
| 3 |  | I feel tense. |
| 4 |  | I feel strained. |
| 5 |  | I feel at ease. (recoded)\* |
| 6 |  | I feel upset. |
| 7 |  | I am presently worrying over possible misfortunes. |
| 8 |  | I feel satisfied. (recoded)\* |
| 9 |  | I feel frightened. |
| 10 |  | I feel comfortable. (recoded)\* |
| 11 |  | I feel self-confident. (recoded)\* |
| 12 |  | I feel nervous. |
| 13 |  | I am jittery. |
| 14 |  | I feel indecisive. |
| 15 |  | I am relaxed. (recoded)\* |
| 16 |  | I feel content. (recoded)\* |
| 17 |  | I am worried. |
| 18 |  | I feel confused. |
| 19 |  | I feel steady. (recoded)\* |
| 20 |  | I feel pleasant. (recoded)\* |
| *Note:* Reverse scored items. | | |

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Table 2. Items of the Neighborhood Violence Scale (NVS)

| Item |  | Description |
| --- | --- | --- |
| 1 |  | I grew up in a safe neighborhood. (recoded)\* |
| 2 |  | Crime was common in the neighborhood where I grew up. |
| 3 |  | In the neighborhood where I grew up, people had plenty of money. (recoded)\* |
| 4 |  | In the neighborhood where I grew up, physical fights were common. |
| 5 |  | In the neighborhood where I grew up, shootings or stabbings occurred. |
| 6 |  | In the neighborhood where I grew up, most people felt unsafe walking alone after dark. |
| 7 |  | Where I grew up, it was important to be able to defend yourself against physical harm. |
| *Note:* Reverse scored items. | | |

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Table 3. Items of the Perceived Childhood Unpredictability scale

| Item |  | Description |
| --- | --- | --- |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |

Go back to [Methods](#unpred)

Table 4. Items of the Questionnaire of Unpredictability in Childhood (QUIC)

| Item |  | Description |
| --- | --- | --- |
|  |  | **Parental monitoring and involvement** |
| 1 |  | I had a set morning routine on school days (i.e., I usually did the same thing each day to get ready). (recoded)\* |
| 2 |  | My caregivers kept track of what I ate (e.g., made sure that I didn’t skip meals or tried to make sure I ate healthy food). (recoded)\* |
| 3 |  | My family ate a meal together most days. (recoded)\* |
| 4 |  | My caregivers tried to make sure I got a good night’s sleep (e.g., I had a regular bedtime, my caregivers checked to make sure I went to sleep). (recoded)\* |
| 5 |  | I had a bedtime routine (e.g, my caregivers tucked me in, my caregivers read me a book, I took a bath). (recoded)\* |
| 6 |  | In my afterschool or free time hours at least one of my caregivers knew what I was doing. (recoded)\* |
| 7 |  | At least one of my caregivers regularly checked that I did my homework. (recoded)\* |
| 8 |  | At least one of my caregivers regularly kept track of my school progress. (recoded)\* |
| 9 |  | At least one caregiver made time each day to see how I was doing. (recoded)\* |
|  |  | **Parental predictability** |
| 10 |  | My caregivers were very late to pick me up (e.g., from school, aftercare or sports). |
| 11 |  | I usually knew when my caregivers were going to be home. (recoded)\* |
| 12 |  | At least one of my caregivers had punishments that were unpredictable. |
| 13 |  | I often wondered whether or not one of my caregivers would come home at the end of the day. |
| 14 |  | My family planned activities to do together. (recoded)\* |
| 15 |  | At least one of my caregivers would plan something for the family, but then not follow through with the plan. |
| 16 |  | My family had holiday traditions that we did every year (e.g., cooking a special food at a particular time of year/decorate the house the same way). (recoded)\* |
| 17 |  | At least one of my caregivers was disorganized. |
| 18 |  | At least one of my caregivers was unpredictable. |
| 19 |  | For at least one of my caregivers, when they were upset I did not know how they would act. |
| 20 |  | One of my caregivers could go from calm to furious in an instant. |
| 21 |  | One of my caregivers could go from calm to stressed or nervous in an instant. |
|  |  | **Parental environment** |
| 22 |  | My caregivers had a stable relationship with each other. (recoded)\* |
| 23 |  | At least one of my caregivers had many romantic partners. |
| 24 |  | There were long periods of time when I didn’t see one of my caregivers (e.g. military deployment, jail time, custody arrangements). |
| 25 |  | I experienced changes in my custody arrangement. |
| 26 |  | At least one of my caregivers changed jobs. |
| 27 |  | One of my caregivers was unemployed and couldn't find a job even though he/she wanted one. |
|  |  | **Physical environment** |
| 28 |  | There were people coming and going in my house that I did not expect to be there. |
| 29 |  | I moved homes. |
| 30 |  | I changed schools. |
| 31 |  | I changed schools mid-year. |
| 32 |  | I lived in a clean house. (recoded)\* |
| 33 |  | I lived in a cluttered house (e.g., piles of stuff everywhere). |
| 34 |  | In my house things I needed were often misplaced so that I could not find them. |
|  |  | **Safety and security** |
| 35 |  | I worried that I was not going to have enough food to eat. |
| 36 |  | I worried that my family would not have enough money to pay for necessities like clothing or bills. |
| 37 |  | I did not feel safe in my home. |
| *Note:* Reverse scored items. | | |

Go back to [Methods](#chaos)

Table 5. Items of the Confusion, Hubbub, and Order Scale (CHAOS)

| Item |  | Description |
| --- | --- | --- |
| 1 |  | There was very little commotion in our home. (recoded)\* |
| 2 |  | We could usually find things when we needed them. (recoded)\* |
| 3 |  | We almost always seemed to be rushed. |
| 4 |  | We were usually able to stay on top of things. (recoded) |
| 5 |  | No matter how hard we tried, we always seemed to be running late. |
| 6 |  | It was a real zoo in our home. |
| 7 |  | At home we could talk to each other without being interrupted.\* |
| 8 |  | There was often a fuss going on at our home. |
| 9 |  | No matter what our family planned, it usually didn't seem to work out. |
| 10 |  | You couldn't hear yourself think in our home. |
| 11 |  | I often got drawn into other people's arguments at home. |
| 12 |  | Our home was a good place to relax. (recoded)\* |
| 13 |  | The telephone took up a lot of our time at home. |
| 14 |  | The atmosphere in our home was calm. (recoded)\* |
| 15 |  | First thing in the day, we had a regular routine at home. (recoded)\* |
| *Note:* Reverse scored items. | | |

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Table 6. Items of the perceived resource scarcity scale

| Item |  | Description |
| --- | --- | --- |
| 1 |  | Your family had enough money to afford the kind of home you all needed.\* |
| 2 |  | Your family had enough money to afford the kind of clothing you all needed.\* |
| 3 |  | Your family had enough money to afford the kind of food that you all needed.\* |
| 4 |  | Your family had enough money to afford the kind of medical care that you all needed.\* |
| 5 |  | I felt well-off (rich, wealthy) compared to other kids in my school.\* |
| 6 |  | I felt well-off (rich, wealthy) compared to other kids in my neighborhood.\* |
| 7 |  | Your family struggled to make ends meet (get by financially). (recoded) |
| *Note:* Reverse scored items. | | |

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Table 7. Items of the Barrett Impulsivity Scale (BIS) - motor impulsivity subscale

| Item |  | Description |
| --- | --- | --- |
| 1 |  | I do things without thinking. |
| 2 |  | I say things without thinking. |
| 3 |  | I act on the spur of the moment. |
| 4 |  | I buy things on impulse. |
| 5 |  | I act on impulse. |

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Table 8. Items of the Future Orientation Scale (FOS)

| Item |  | Description |
| --- | --- | --- |
|  |  | **Planning ahead** |
| 1 |  | I jump right into things without planning them out beforehand. (recoded)\* |
| 2 |  | I think making lists of things to do is a waste of time. (recoded)\* |
| 3 |  | I usually make plans before going ahead with my decision. |
| 4 |  | I think things work out better if they are planned out in advance. |
| 5 |  | I think breaking big projects down into small steps isn't really necessary. (recoded)\* |
|  |  | **Time perspective** |
| 6 |  | I spend a lot of time thinking about how things might be in the future. |
| 7 |  | I give up my happiness now to get what I want in the future. |
| 8 |  | I'd rather spend money right away than save it for a rainy day. (recoded)\* |
| 9 |  | I don't try to imagine what my life will be like in 10 years. (recoded)\* |
| 10 |  | I am always thinking about what tomorrow will bring. |
|  |  | **Anticipation of future consequences** |
| 11 |  | I don't think about every little possibility before making a decision. (recoded)\* |
| 12 |  | When I act, I don't think about the consequences. (recoded)\* |
| 13 |  | I am pretty good at seeing in advance how one thing can lead to another. |
| 14 |  | I think a lot about how my decisions will affect others. |
| 15 |  | I think it is best not to worry about things you can't predict. (recoded)\* |
| *Note:* Reverse scored items. | | |

Go back to [Methods](#depression)

Table 9. Items of the Epidemiologic Studies Depression Scale (CESD)

| Item |  | Description |
| --- | --- | --- |
| 1 |  | I was bothered by things that usually don't bother me. |
| 2 |  | I did not feel like eating; my appetite was poor. |
| 3 |  | I felt that I could not shake off the blues even with help from my family and friends. |
| 4 |  | I felt that I was just as good as other people. (recoded)\* |
| 5 |  | I had trouble keeping my mind on what I was doing. |
| 6 |  | I felt depressed. |
| 7 |  | I felt that everything I did was an effort. |
| 8 |  | I felt hopeful about the future. (recoded)\* |
| 9 |  | I thought my life had been a failure. |
| 10 |  | I felt fearful. |
| 11 |  | My sleep was restless. |
| 12 |  | I was happy. (recoded)\* |
| 13 |  | I talked less than usual. |
| 14 |  | I felt lonely. |
| 15 |  | People were unfriendly. |
| 16 |  | I enjoyed life. (recoded)\* |
| 17 |  | I had crying spells. |
| 18 |  | I felt sad. |
| 19 |  | I felt that people dislike me. |
| 20 |  | I could not get "going". |
| *Note:* Reverse scored items. | | |