Body Weight and Attentional Capture in Children

Short title: BODY WEIGHT AND ATTENTION

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Conflict of Interest

The authors declare no competing interests.

Author contribution

All authors designed the study, and S.T. collected and analyzed the data. All authors discussed the results and wrote the manuscript.

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Abstract

The present study examined whether numerical representations of body weight capture visual attention in young children. Developmental studies showed that even newborn infants could distinguish between typical and atypical human bodies, and infants aged around six months detect multisensory events occurring on their bodies. These findings suggest that the body image develops earlier and continues to establish. However, the development of recognition of numerical own body information such as body weight is less understood. Therefore, we employed an attentional capture task where children identified a target embedded in a visual stream, preceded by their body weight number presented before the target. A total of 44 Japanese children (ages 8–9 years; equal number of boys and girls) participated. Results indicated that girls exhibited attentional bias toward their weight, whereas boys did not. Compared to boys, girls showed the attentional capture of body weight.

Keywords

Child, Development, Body weight, Attentional capture

Introduction

How do we acquire a representative body image? Developmental studies have shown that body representation develops gradually, even in infants. Previous studies using behavioral and electroencephalography experiments have demonstrated that infants as young as 3 months can distinguish between typical and atypical human bodies. This suggests that sensitivity to structural information of the human body develops by this age (Gliga & Dehaene-Lambertz, 2005; Zieber et al., 2015). By 5 months, infants can distinguish between male and female bodies, reflecting the successful classification of the human body (Hock et al., 2015). Moreover, 9-month-old infants can differentiate between typical and atypical bodies regardless of the type of stimulus, such as real human bodies or mannequins (Heron & Slaughter, 2010). This indicates that older infants have developed a generalized representation of the human body. In addition to developing body image, infants develop body representations after birth. Newborn infants can detect multisensory bodily events occurring on their bodies based on the congruent visual-tactile stimuli (Filippetti et al., 2013; Filippetti et al., 2015; Filippetti et al., 2015; Zmyj et al., 2011). In these previous studies, the experimenter stroked infants' faces with a brush, in which the strokes matched or non-matched the brush stroke on the infants' corresponding cheek displayed on the screen. Their results found that newborns preferred synchronous video compared to that of asynchronous. This successful detection of visual-tactile synchrony has been reported on other body parts such as hands in 6 months (Freier et al., 2016) and legs in 7 months (Zmyj et al., 2011). These findings imply the development of their body representations (for review Yang et al., 2021). Though these studies are based on concrete representations such as physical body images, the development of numerical representations of the body is unclear. The present study examined whether children have a numerical bodily representation by adopting an attentional capture task in which body weight was used as a distractor. Abstract information about oneself, such as name, captures visual attention (Conway et al., 2001; Ocampo & Kahan, 2015; Yang et al., 2013). Therefore, it is plausible that other forms of abstract information, such as one's body weight, also capture attention.

Salient stimuli, such as the human body, capture our attention. For example, body image influences the search for a target (Cass et al., 2020). This attentional capture is pronounced depending on one's level of dissatisfaction with their body (Cass et al., 2020; Cobb et al., 2018; Fuller-Tyszkiewicz et al., 2020). Individuals with a negative perception of their bodies, such as feeling dissatisfied or wanting to change some parts of their bodies, were more likely to have their attention captured by body-related information. Consistent with these studies, it has been shown that attentional capture occurred to words related to the body, such as "fat" (So et al., 2019). However, it is unclear whether numerical information, such as weight, also captures visual attention.

The present study investigated whether body weight captures visual attention in children aged 8–9 years. The reasons for using body weight are as follows. First, it is a self-relevant measure frequently assessed during dieting or health checks. In Japan, physical measurements, including height and weight, and other health checks, such as visual acuity, are conducted annually, and in some elementary schools, they are carried out at the beginning of each term. Therefore, body-related measurements are very familiar to Japanese school-aged children. Second, it is a significant indicator associated with various health problems (Aiello et al., 2018; Choudhry et al., 2013; Tashiro et al., 2023), so it is a body metric that many individuals are concerned about. In recent years in Japan, attention has been given to issues such as diseases related to obesity from early childhood (Masabuchi et al., 2022; Matsushita et al., 2012; Murakami et al., 2012; Okubo et al., 2024; Takaya et al., 2023). Several studies showed associations between cognitive abilities such as mental flexibility or executive control and body mass index during childhood (Cserjési et al., 2007; Tomaso et al., 2022), suggesting the importance of understanding one’s body. We used a rapid serial visual presentation (RSVP) task by inserting a distractor (body weight or an irrelevant number) into a stream consisting of letters. Two temporal lags (200 and 800 ms) existed between the distractor and targets. Classically, target identification is impaired when the lag between the salient distractor and the target is short (Asplund et al., 2010; Most et al., 2005; Wang et al., 2012). It was hypothesized that the attentional capture of body weight impairs target identification. However, if body weight does not capture attention, no difference in target accuracy is expected.

Recently, children’s physical changes have been a growing concern in Japan (Ministry of Education, Culture, Sports, Science and Technology-Japan, 2024). The prevalence of childhood obesity increased in school-aged children from 2012 to 2021 (Fujiwara et al., 2024). Furthermore, this change has also been reported during the COVID-19 pandemic (Okubo et al., 2024). Childhood obesity showed an apparent increase due to the pandemic from 2020 to 2022, while childhood underweight saw an increase in 2022, with a greater impact observed in girls compared to boys, suggesting that girls may exhibit differences in weight. In addition to these physical changes, studies investigating the children's attitude toward their bodies revealed that girls aged approximately 9 years old had greater body dissatisfaction than boys (Gardner et al., 1999; Guzmán de la Garza et al., 2019; Xanthopoulos et al., 2011), and girls were more accurate than boys in estimating their body size (Drilen et al., 2025; Rouche et al., 2024). These findings imply that attentional bias to body weight in the present study may be more pronounced in girls than in boys. Based on these, we predicted that attentional capture of weight would occur in girls.

Experiment

Methods

Participants

A total of 44 children between 8 to 9 years participated in the experiment. The numbers of boys and girls were equal (boys: M_{age} = 8.5, SD = 0.51, range = 98-119 months; girls: M_{age} = 8.54, SD = 0.50, range = 96-119 months). All participants had normal or corrected-to-normal visual acuity. The sample size was determined based on studies using the rapid serial visual presentation task with children (Croker & Maratos, 2011; Russo et al., 2016; Russo, Kates, & Wyble, 2017). The caregivers of all the participants provided written informed consent before participating in the experiment. The ethical committee of Chuo University approved this study.

Apparatus and Stimuli

All stimuli were presented on a Laptop PC with a refresh rate of 60 Hz and a resolution of 1920 × 1080 pixels using PsychoPy v2024.2.1. Each stimulus was presented on a grey background at a viewing distance of 60 cm.

The stimuli are letters of the alphabet and body weight numbers. As a distractor stimulus, body weight in kilograms was presented to the first decimal place (e.g., 32.1). Three identical letters were presented (e.g., AAA) to match the body weight numbers. An irrelevant number was obtained as a control by dividing body weight by three. If its resulting number had one or two digits, it was padded with zeros (e.g., 1.2 into 01.2). The letters I, O, P, and S were not used because of their similarity to the other letters. The letters F, G, H, J, and K were selected as targets, whereas all the other letters were non-targets. Non-target letters and distractor numbers were presented in white color, but the target letter was black color. Each stimulus subtended 6.0° in width and 2.0° in height and was presented at the center of the screen.

Procedure

Children were tested individually in a room at the Japan National Museum of Emerging

Science and Innovation (Miraikan) in Tokyo, Japan. The experiment staff guided the experiment to visiting children and their parents and escorted those who agreed to participate in the laboratory. At this time, we also confirmed their knowledge of their body weight and Latin alphabet reading ability, and only children who could answer both were included as participants in the experiment. After introducing the experimental procedure to the caregiver and the children, the children were moved to the desk for the experiment. At the start of the experiment program, fields for entering the participant's gender, age, and weight were displayed, and the experiment began after each field was filled in.

In the present task, participants were asked to identify which of the five alphabets—F, G, H, J, or K—was the black-colored one among the white-colored alphabets. At the beginning of each trial, a black circle appeared at the center of the screen for fixation (Fig. 1). The participants initiated each trial by pressing the spacebar. After a few-second delay, randomly chosen from 1000, 1250, or 1500 ms, a visual stream of letters was presented at a rate of 80 ms/item with a 20 ms inter-stimulus interval. The temporal separation between the target and the digit was 200 ms or 800 ms. The number of non-targets preceding the distractor was determined randomly for each trial, varying between 6 and 10. The number of non-targets following the target was 10. After 1,000 ms, the visual stream was presented; the participants answered the black-colored letter by entering the corresponding key. The participants were instructed to respond as accurately as possible. The experiment comprised 80 trials (20 trials for each lag and distractor) preceded by 10 practice trials. After every 10 trials, the accuracy rate up to that point was displayed as feedback.

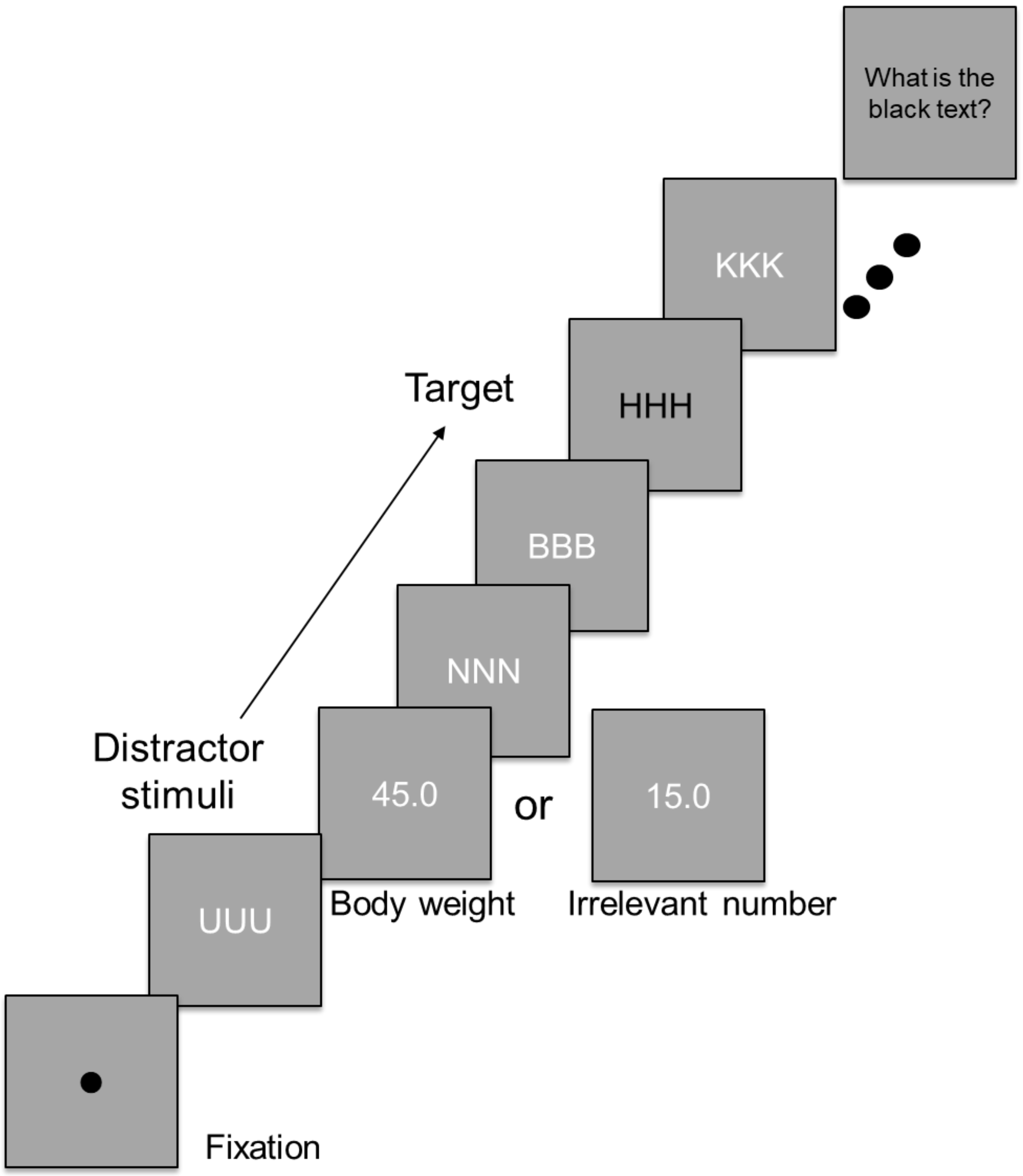

Figure 1. Rapid serial visual presentation task in the current experiment. The task is to identify the black-colored alphabet target after the onset of distractor stimuli. There are two lag conditions (200 and 800 ms).

Results

The accuracy of target identification was calculated under each condition. For boys, the body weight accuracy at 200 ms and 800 ms lags were 0.62 and 0.6. The accuracies of the irrelevant number as a control in lags 200 and 800 ms were 0.58 and 0.6. For girls, the body weight accuracies at 200 and 800 ms lag times were 0.55 and 0.56. The control's 200 and 800 ms lags accuracies were 0.58 and 0.61. To investigate whether body weight captures a child's attention, we conducted a three-way analysis of variance (ANOVA) on accuracy. The factors included sex (boy or girl) as the between-participant factor and lag (200 and 800 ms) and distractor type (body weight or control) as the within-participant factors. We found the significant interaction between sex and distractor ($F(1,42) = 6.61$, $p = .014$, $\eta_p^2 = .13$). The tests of simple effects revealed that the accuracy in body weight condition was significantly lower than that in control condition only in girls (Fig. 2). Thus, this suggests the attentional capture of body weight in girls ($F(1,21) = 7.16$, $p = .014$, $\eta_p^2 = .25$). We did not find the difference between sex and lag ($F(1,42) = .24$, $p = .63$, $\eta_p^2 = .005$). There were no significant main effects of sex ($F(1,42) = .17$, $p = .68$, $\eta_p^2 = .003$), lag ($F(1,42) = .23$, $p = .62$, $\eta_p^2 = .005$), and distractor ($F(1,42) = .92$, $p = .34$, $\eta_p^2 = .02$). Furthermore, no significant interaction between three factors ($F(1,42) = .02$, $p = .87$, $\eta_p^2 < .01$) and lag and distractor ($F(1,42) = .73$, $p = .39$, $\eta_p^2 = .01$).

The results showed that girls could not correctly identify the target following body weight compared to boys, indicating a gender difference in the attentional capture of body weight. Furthermore, no general lag effect was observed, and attention capture occurred for both lags (200 and 800 ms).

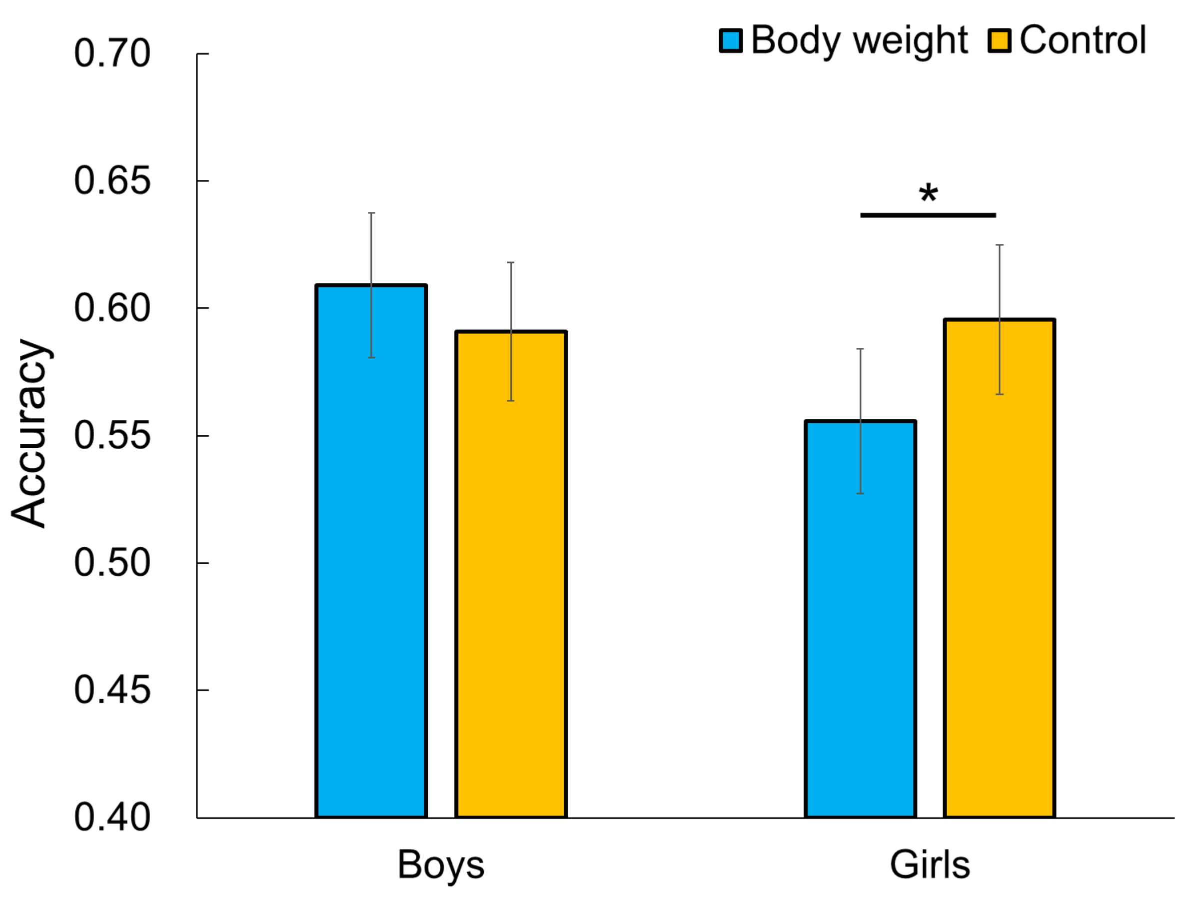

Figure 2. Mean identification accuracy of the target. Error bars represent standard errors. *$p < .05$

Discussion

This study examined whether numbers representing one's body weight captured visual attention in younger children. We found a deficit in identifying targets among girls, implying a gender difference in the attentional capture of body weight. There was no lag effect, and attentional capture occurred even with a longer lag (800 ms). Our results suggest that children, particularly girls, have numerical bodily representations.

As expected, there was a gender difference in the attentional capture of body weight; girls showed attentional capture but not boys. This attentional capture of weight observed in girls is consistent with previous studies suggesting that girls better perceive their own bodies. A study conducted with the same age group as the present study reported that girls were more accurate than boys in estimating their body size (Drilen et al., 2025). This accurate estimation of one's body size can also be observed in younger children, approximately 6 years (Pallan et al., 2011). This difference between girls and boys is thought to be influenced by judgments regarding satisfaction with one’s own body. Notably, it has been reported that not only adults but also children show lower body satisfaction in girls compared to boys (Gardner et al., 1999; Guzmán de la Garza et al., 2019; Tremblay et al., 2011; Xanthopoulos et al., 2011). The gap between one’s actual body and ideal body in girls might contribute to the prevalence of eating disorders in adolescence and adulthood mainly on women (American Psychiatric Association, 2013). Studies on adult women have shown that individuals with body dissatisfaction exhibit attention toward images of overweight/thin bodies (Berrisford-Thompson et al., 2021; Fuller-Tyszkiewicz et al., 2020; Gao et al., 2013), body-related words (Leng et al., 2024; So et al., 2019; Yao et al., 2023), and foods (Xie et al., 2023; Xie et al., 2025). Eye-tracking research has also demonstrated that such individuals initially fixate on the body or related words and detect them more quickly (Bauer et al., 2017; Gao et al., 2011). Although the present study assessed no individual body satisfaction, the present result suggests that girls' attention to body weight develops at a relatively early developmental stage, such as in the middle elementary school grades. The emergence of interest in one's body during elementary school might contribute to the foundation of strong body awareness observed in adulthood.

We observed the attentional capture of body weight at both short and long lags, indicating that attentional capture persisted for approximately one second. Specifically, body weight captures visual attention. It has been reported that the attentional capture persisted in individuals with obsessive-compulsive disorder (Olatunji, 2021) or cannabis addiction (Campbell et al., 2020) when viewing emotionally negative or cannabis images were presented. In these studies, the same RSVP task as in the present study was conducted, where participants were asked to search for a single image among various images that differed in orientation. At this time, either a neutral or a fearful/aversive distractor was presented just before the target (lag 2) or even earlier (lag 8). Consequently, classic attentional capture occurred, with the target accuracy decreasing for distractors other than neutral ones, and the timing of the short lag distractor presentation (lag 2) led to greater accuracy reduction. Interestingly, this lag difference was weaker in individuals with obsessive-compulsive disorder (Olatunji, 2021) and cannabis addiction (Campbell et al., 2020), where attentional capture by the distractors persisted even with a greater lag between the target and distractor. These findings imply that attentional capture lasts longer regardless of the lag if the distractors are highly attention-capturing for the observer. Body weight is believed to capture attention in a bottom-up manner, continuously interfering with the subsequent processing of working memory.

In conclusion, we found that body weight captured visual attention in girls aged 8–9 years, suggesting that numerical bodily representations are formed in girls at a relatively early age. Exploring whether the attentional capture of weight occurs in adolescent and adult women and whether body satisfaction influences this capture remains for future study.

Reference

1. Aiello, M., Ambron, E., Situlin, R., Foroni, F., Biolo, G., & Rumiati, R. I. (2018). Body weight and its association with impulsivity in middle and old age individuals. *Brain and cognition*, 123, 103–109. https://doi.org/10.1016/j.bandc.2018.03.006
2. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596
3. Asplund, C. L., Todd, J. J., Snyder, A. P., Gilbert, C. M., & Marois, R. (2010). Surprise-induced blindness: A stimulus-driven attentional limit to conscious perception. *Journal of Experimental Psychology: Human Perception and Performance*. 36(6), 1372-1381. https://doi.org/10.1037/a0020551
4. Bauer, A., Schneider, S., Waldorf, M., Braks, K., Huber, T. J., Adolph, D., & Vocks, S. (2017). Selective Visual Attention Towards Oneself and Associated State Body

Satisfaction: an Eye-Tracking Study in Adolescents with Different Types of Eating Disorders. *Journal of abnormal child psychology*, 45(8), 1647–1661. https://doi.org/10.1007/s10802-017-0263-z

5. Berrisford-Thompson, J., Sayers, S., Bell, J., Dondzilo, L., & Kennedy, B. L. (2021). Blinded by bodies: Elevated eating disorder symptomatology is associated with increased attentional priority for thin bodies. *Body image*, 39, 237–247. https://doi.org/10.1016/j.bodyim.2021.09.003
6. Bibiloni, M. D. M., Coll, J. L., Pich, J., Pons, A., & Tur, J. A. (2017). Body image satisfaction and weight concerns among a Mediterranean adult population. *BMC Public Health*, 17, 39. https://doi.org/10.1186/s12889-016-3919-7
7. Bolmont, M., Bianchi-Demicheli, F., Boisgontier, M. P., & Cheval, B. (2019). The Woman's Body (Not the Man's One) Is Used to Evaluate Sexual Desire: An Eye-Tracking Study of Automatic Visual Attention. *Journal of Sexual Medicine*, 16(2), 195–202. https://doi.org/10.1016/j.jsxm.2018.12.003
8. Campbell, D. W., Stewart, S., Gray, C. E. P., Ryan, C. L., Fettes, P., McLandress, A. J., & Dell'Aquila, R. (2018). Chronic cannabis use and attentional bias: Extended attentional capture to cannabis cues. *Addictive Behaviors*, 81, 17–21. https://doi.org/10.1016/j.addbeh.2018.01.008

9. Cass, J., Giltrap, G., & Talbot, D. (2020). Female Body Dissatisfaction and Attentional Bias to Body Images Evaluated Using Visual Search. *Frontiers in Psychology*, 10, 2821. https://doi.org/10.3389/fpsyg.2019.02821
10. Choudhry, Z., Sengupta, S. M., Grizenko, N., Harvey, W. J., Fortier, M. È., Schmitz, N., & Joober, R. (2013). Body weight and ADHD: examining the role of self-regulation. *PloS one*, 8(1), e55351. https://doi.org/10.1371/journal.pone.0055351
11. Cobb, A., Rieger, E., & Bell, J. (2018). Inhibition of return for body images in individuals with shape/weight based self-worth. *Journal of eating disorders*, 6, 25. https://doi.org/10.1186/s40337-018-0211-5
12. Conway, A. R., Cowan, N., & Bunting, M. F. (2001). The cocktail party phenomenon revisited: the importance of working memory capacity. *Psychonomic bulletin & review*, 8(2), 331–335. https://doi.org/10.3758/bf03196169
13. Croker, S., & Maratos, F. A. (2011). Visual Processing Speeds in Children. *Child Development Research*, 2011, 1–6. https://doi.org/10.1155/2011/450178
14. Cserjési, R., Molnár, D., Luminet, O., & Lénárd, L. (2007). Is there any relationship between obesity and mental flexibility in children?. *Appetite*, 49(3), 675–678. https://doi.org/10.1016/j.appet.2007.04.001
15. Drilen, T. L., Eik-Nes, T. T., Ersfjord, E. M. I., Klöckner, C. A., & Ødegård, R. A. (2025). Perceived body size across sex and weight categories and its association with body size

dissatisfaction: a cross-sectional study among early primary school children in Norway. *BMC Public Health*, 25, 1210 https://doi.org/10.1186/s12889-025-22219-z

16. Filippetti, M. L., Johnson, M. H., Lloyd-Fox, S., Dragovic, D., & Farroni, T. (2013). Body perception in newborns. *Current Biology*, 23(23), 2413-2416. https://doi.org/10.1016/j.cub.2013.10.017
17. Filippetti, M. L., Lloyd-Fox, S., Longo, M. R., Farroni, T., & Johnson, M. H. (2015). Neural mechanisms of body awareness in infants. *Cerebral Cortex*, 25(10), 3779-3787. https://doi.org/10.1093/cercor/bhu261
18. Filippetti, M. L., Orioli, G., Johnson, M. H., & Farroni, T. (2015). Newborn body perception: sensitivity to spatial congruency. *Infancy*, 20(4), 455-465. https://doi.org/10.1111/infa.12083
19. Freier, L., Mason, L., & Bremner, A. J. (2016). Perception of visual-tactile colocation in the first year of life. *Developmental psychology*, 52(12), 2184–2190. https://doi.org/10.1037/dev0000160
20. Fuller-Tyszkiewicz, M., Vuong, H., Linardon, J., Krug, I., Broadbent, J., & Rodgers, R. F. (2020). Body image in and out of the lab: Correspondence between lab-based attentional bias data and body shape dissatisfaction experiences in daily life. *Body image*, 32, 62–69. https://doi.org/10.1016/j.bodyim.2019.11.002
21. Gao, X., Li, X., Yang, X., Wang, Y., Jackson, T., & Chen, H. (2013). I can't stop looking at

them: interactive effects of body mass index and weight dissatisfaction on attention towards body shape photographs. *Body image*, 10(2), 191–199. https://doi.org/10.1016/j.bodyim.2012.12.005

22. Gao, X., Wang, Q., Jackson, T., Zhao, G., Liang, Y., & Chen, H. (2011). Biases in orienting and maintenance of attention among weight dissatisfied women: an eye-movement study. *Behaviour research and therapy*, 49(4), 252–259. https://doi.org/10.1016/j.brat.2011.01.009
23. Gardner, R. M., Friedman, B. N., Stark, K., & Jackson, N. A. (1999). Body-size estimations in children six through fourteen: a longitudinal study. *Perceptual and motor skills*, 88(2), 541–555. https://doi.org/10.2466/pms.1999.88.2.541
24. Gliga, T., & Dehaene-Lambertz, G. (2005). Structural encoding of body and face in human infants and adults. *Journal of Cognitive Neuroscience*, 17(8), 1328–1340. https://doi.org/10.1162/0898929055002481
25. Guzmán de la Garza, F. J., Salinas-Martínez, A. M., Zendejas-Valdéz, J. M., Cordero-Franco, H. F., Mathiew-Quirós, Á., & de la Garza-Salinas, L. H. (2019). Body frame size, body image, self-esteem, and health-related quality of life in schoolchildren. *American journal of human biology: the official journal of the Human Biology Council*, 31(5), e23294. https://doi.org/10.1002/ajhb.23294

26. Heron, M., & Slaughter, V. (2010). Infants' responses to real humans and representations of humans. *International Journal of Behavioral Development*, 34(1), 34–45. doi:10.1177/016502540 9345047

27. Hock, A., Kangas, A., Zieber, N., & Bhatt, R. S. (2015). The development of sex category representation in infancy: Matching of faces and bodies. *Developmental Psychology*, 51(3), 346–352. https://doi.org/10.1037/a0038743

28. House, T., Graham, K., Ellis, B., Bould, H., Attwood, A. S., Stephen, I. D., Brooks, K. R., & Penton-Voak, I. S. (2023). Is body dissatisfaction related to an attentional bias towards low weight bodies in non-clinical samples of women? A systematic review and meta-analysis. *Body image*, 44, 103–119. https://doi.org/10.1016/j.bodyim.2022.12.003

29. Kashubeck-West, S., Mintz, L. B., & Weigold, I. (2005). Separating the effects of gender and weight-loss desire on body satisfaction and disordered eating behavior. *Sex Roles*, 53, 505–518. https://doi.org/10.1007/s11199-005-7138-4

30. Leng, X., Yu, X., Chen, Y., Wang, T., Zhao, F., Feng, C., & Feng, W. (2024). Temporal dynamics of spatial attentional biases toward weight-related words among females with weight dissatisfaction. *Biological psychology*, 190, 108807. https://doi.org/10.1016/j.biopsycho.2024.108807

31. Masubuchi, R., Noda, M., Yoshida, S., & Kawakami, K. (2022). Longitudinal study of body mass index and percentage of overweight in Japanese children grouped by maturity. *Endocrine journal*, 69(4), 451–461. https://doi.org/10.1507/endocrj.EJ21-0434

32. Matsushita, Y., Yoshiike, N., Kaneda, F., Yoshita, K., & Takimoto, H. (2004). Trends in childhood obesity in Japan over the last 25 years from the national nutrition survey. *Obesity research*, 12(2), 205–214. https://doi.org/10.1038/oby.2004.27

33. Ministry of Education, Culture, Sports, Science and Technology-Japan. (2024). School Health Statistics Survey: Summary of Results for 2024. Retrieved April 1, 2025, from https://www.mext.go.jp/b_menu/toukei/chousa05/hoken/kekka/k_detail/2024.htm

34. Most, S. B., Chun, M. M., Widders, D. M., Haven, N., & Zald, D. H. (2005). Attentional rubbernecking: Cognitive control and personality in emotion-induced blindness. *Psychonomic Bulletin & Review*, 12(4), 654–661. https://doi.org/10.3758/bf03196754

35. Murakami, K., Miyake, Y., Sasaki, S., Tanaka, K., & Arakawa, M. (2012). An energy-dense diet is cross-sectionally associated with an increased risk of overweight in male children, but not in female children, male adolescents, or female adolescents in Japan: the Ryukyus Child Health Study. *Nutrition research (New York, N.Y.)*, 32(7), 486–494. https://doi.org/10.1016/j.nutres.2012.05.011

36. Nagashima, Y., Inokuchi, M., Yasui, Y., Uchida, K., Tokumura, M., & Hasegawa, T. (2022). Impact of school closure due to the coronavirus disease 2019 pandemic on body

mass index in Japanese children: Retrospective longitudinal study. *Journal of paediatrics and child health*, 58(10), 1841–1846. https://doi.org/10.1111/jpc.16122

37. Ocampo, B. & Kahan, T. A. (2015). Evaluating automatic attentional capture by self-relevant information. *Cognitive Neuroscience*, 7(1-4), 22-23. https://doi.org/10.1080/17588928.2015.1075486

38. Okubo, Y., Ishitsuka, K., & Goto, A. (2024). Impact of COVID-19 pandemic on physical health amongst children: Difference-in-differences analyses of nationwide school health checkup database. *Pediatric obesity*, 19(7), e13126. https://doi.org/10.1111/ijpo.13126

39. Olatunji, B. O. (2021). Emotional induced attentional blink in obsessive-compulsive disorder. *Journal of Affective Disorders*, 283, 101–107. https://doi.org/10.1016/j.jad.2020.12.204

40. Pallan, M. J., Hiam, L. C., Duda, J. L., & Adab, P. (2011). Body image, body dissatisfaction and weight status in South Asian children: a cross-sectional study. *BMC public health*, 11, 21. https://doi.org/10.1186/1471-2458-11-21

41. Rouche, M., Lebacq, T., Dzielska, A., Kelly, C., Gabhainn, S. N., Mertens, C., & Castetbon, K. (2024). Cross-National Study on the Convergent, Discriminant, and Concurrent Validity of the "Body Size Perception" Item in the Health Behaviour in School-aged Children Survey. *Current developments in nutrition*, 8(9), 104445.

42. Russo, N., Kates, W. R., & Wyble, B. (2017). Developmental changes in feature detection

across time: Evidence from the attentional blink. *Journal of Experimental Child Psychology*, 164, 32–44. https://doi.org/10.1016/j.jecp.2017.06.013

43. Russo, N., Kates, W. R., Shea, N., LeBlanc, M., & Wyble, B. (2016). Adults blink more deeply: a comparative study of the attentional blink across different age groups. *Developmental Science*, 21(2), 1–8. https://doi.org/10.1111/desc.12512

44. So, M. Y., Wang, X., & Gao, X. (2019). Body Dissatisfaction Enhances Awareness and Facilitates the Consolidation of Body-Related Words During Rapid Serial Visual Presentation. *Frontiers in psychology*, 10, 2614. https://doi.org/10.3389/fpsyg.2019.02614

45. Takaya, J., Higashino, H., Takaya, R., Sakaguchi, H., Tanoue, J., Higashide, T., Moriguchi, H., Nakao, M., & Takai, Y. (2023). Effect of the COVID-19 pandemic lockdown on the physique of school-age children in Japan. *Annals of pediatric endocrinology & metabolism*, 28(2), 124–130. https://doi.org/10.6065/apem.2244228.114

46. Tashiro, M., Yasuda, N., Inoue, M., Yamagishi, K., Tsugane, S., & Sawada, N. (2023). Body mass index, weight change in midlife, and dementia incidence: the Japan Public Health Center-based Prospective Study. *Alzheimer's & dementia (Amsterdam, Netherlands)*, 15(4), e12507. https://doi.org/10.1002/dad2.12507

47. Tomaso, C. C., James, T., Nelson, J. M., Espy, K. A., & Nelson, T. D. (2022). Longitudinal associations between executive control and body mass index across childhood. *Pediatric obesity*, 17(4), e12866. https://doi.org/10.1111/ijpo.12866

48. Tremblay, L., Lovsin, T., Zecevic, C., & Larivière, M. (2011). Perceptions of self in 3-5-year-old children: a preliminary investigation into the early emergence of body dissatisfaction. *Body image*, 8(3), 287–292. https://doi.org/10.1016/j.bodyim.2011.04.004

49. Wang, L., Kennedy, B. L., & Most, S. B. (2012). When emotion blinds: A spatiotemporal competition account of emotion-induced blindness. *Frontiers in Psychology*, 3 1–6. https://doi.org/10.3389/fpsyg.2012.00438

50. Xanthopoulos, M. S., Borradaile, K. E., Hayes, S., Sherman, S., Vander Veur, S., Grundy, K. M., Nachmani, J., & Foster, G. D. (2011). The impact of weight, sex, and race/ethnicity on body dissatisfaction among urban children. *Body image*, 8(4), 385–389. https://doi.org/10.1016/j.bodyim.2011.04.01

51. Xie, P., Sang, H., Wang, X., & Huang, C. (2025). The effect of emotional cues on attentional bias to food cues in women with body weight dissatisfaction. *Appetite*, 208, 107913. https://doi.org/10.1016/j.appet.2025.107913

52. Xie, P., Sang, H. B., Huang, C. Z., & Zhou, A. B. (2023). Effect of body-related information on food attentional bias in women with body weight dissatisfaction. *Scientific reports*, 13(1), 16736. https://doi.org/10.1038/s41598-023-43455-6

53. Yang, J., Yamaguchi, M. K., & Bremner, A. J. (2021). The development of body representations in human infants. *Philosophy & cultural embodiment*, 1(1), 18-28.

54. Yang, H., Wang, F., Gu, N., Gao, X., & Zhao, G. (2013). The cognitive advantage for one's

name is not simply familiarity: An eye-tracking study. *Psychonomic Bulletin and Review*, 20(6), 1176-1180. https://doi.org/10.3758/s13423-013-0426-z

55. Yao, J., Leng, X., Chen, Y., Chen, M., Liu, A., Feng, C., & Feng, W. (2023). Attentional suppression of weight-related distractors among females with weight dissatisfaction. *Psychophysiology*, 60(12), e14408. https://doi.org/10.1111/psyp.14408
56. Zieber, N., Kangas, A., Hock, A., & Bhatt, R. S. (2015). Body Structure Perception in Infancy. *Infancy*, *20*(1), 1–17. https://doi.org/10.1111/infa.12064
57. Zmyj, N., Jank, J., Schütz-Bosbach, S., & Daum, M. M. (2011). Detection of visual–tactile contingency in the first year after birth. *Cognition*, 120(1), 82-89. https://doi.org/10.1016/j.cognition.2011.03.001