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Visual attention to food cues and the course of anorexia nervosa

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ABSTRACT

Previously, adolescents with anorexia nervosa (AN) showed reduced attentional engagement with food cues compared to adolescents without eating disorder (Jonker, Glashouwer, Hoekzema, Ostafin, & De Jong, 2019). This study tested whether (i) improvement in eating disorder symptoms and BMI are related to an increase in attentional engagement with food, and whether (ii) relatively low attentional engagement is related to persistent AN symptomatology, in the same sample of adolescents with AN (N = 69) from the study of Jonker et al. (2019). Eating disorder symptoms, BMI, and attention for food cues were measured during baseline and at one year follow-up. Adolescents with AN showed a substantial improvement in symptoms and BMI. However, their low attentional engagement with food cues remained unchanged. Change in attentional engagement with food was not related to change in symptoms, nor was low baseline attentional engagement with food predictive of symptom persistence. These findings indicate that improvement in AN symptoms does not seem to require an increase in attentional engagement with food.

Anorexia Nervosa (AN) is a severe mental disorder that mostly affects adolescent girls and young women (Schmidt et al., 2016). Patients with AN are characterized by an extreme restriction of food intake and an intense fear of gaining weight or becoming fat despite being underweight (American Psychiatric Association, 2013). Leading therapies for AN show only limited effectiveness, and relapse after treatment is common (Brockmeyer, Friederich, & Schmidt, 2017; Khalsa, Portnoff, McCurdy-McKinnon, & Feusner, 2017; Zipfel et al., 2014). To improve the effectiveness of treatment it is important to increase our understanding of the mechanisms that underlie the development and persistence of eating disorder symptoms (Jansen, 2016). A process that has been of interest in this regard is patients' spatial attentional bias to food (Giel et al., 2011; Kim et al., 2014; Lloyd & Steinglass, 2018; Veenstra & de Jong, 2012).

People are biased in their attention to cues that are motivationally salient (Pool, Brosch, Delplanque, & Sander, 2016). Accordingly, food deprived (i.e., hungry) healthy weight individuals have been found to show an attentional bias (AB) to food cues (Castellanos et al., 2009; Giel et al., 2011; Nijs, Muris, Euser, & Franken, 2010; Stockburger, Weike, Hamm, & Schupp, 2008; Tapper, Pothos, & Lawrence, 2010; but see,; Leland & Pineda, 2006). In addition, there is evidence that healthy weight individuals no longer show an AB for food when they are satiated (Castellanos et al., 2009; Jonker, Bennik, de Lang, & de Jong, 2020; Stockburger et al., 2008). From this perspective, heightened AB for food in response to food deprivation might be seen as an adaptive process that promotes food intake when individuals are deprived of food. It has been proposed that individuals with AN might lack this adaptive process, contributing to their ability to refrain from food even while being in a state of starvation (Lloyd & Steinglass, 2018). Consequently, low attention to food might be a relevant factor in the persistence of AN and might compromise the efficacy of interventions that are aimed to normalize food-intake of patients with AN.

Recently, we found strong evidence (BF_{10} 29.66) that adolescents with AN showed less attentional engagement with briefly shown food cues than adolescents without an eating disorder (Jonker et al., 2019). More specifically, adolescents without an eating disorder showed significant attentional engagement with food cues when presented for 100 ms and individuals with AN did not show such a bias. When food cues were shown longer (500 ms) no such difference appeared, nor did individuals with AN and individuals without an eating disorder differ on attentional disengagement from food cues. An important next step is to examine whether this low attentional engagement with food cues is involved in the persistence of AN. The current study used a longitudinal design to test 1) whether a reduction in symptoms of AN is paralleled by an increase in attentional engagement with food cues from baseline to one-year follow-up, and 2) whether relatively weak attentional engagement with food cues at baseline is related to less improvement in eating disorder symptoms and BMI from baseline to one year follow-up.

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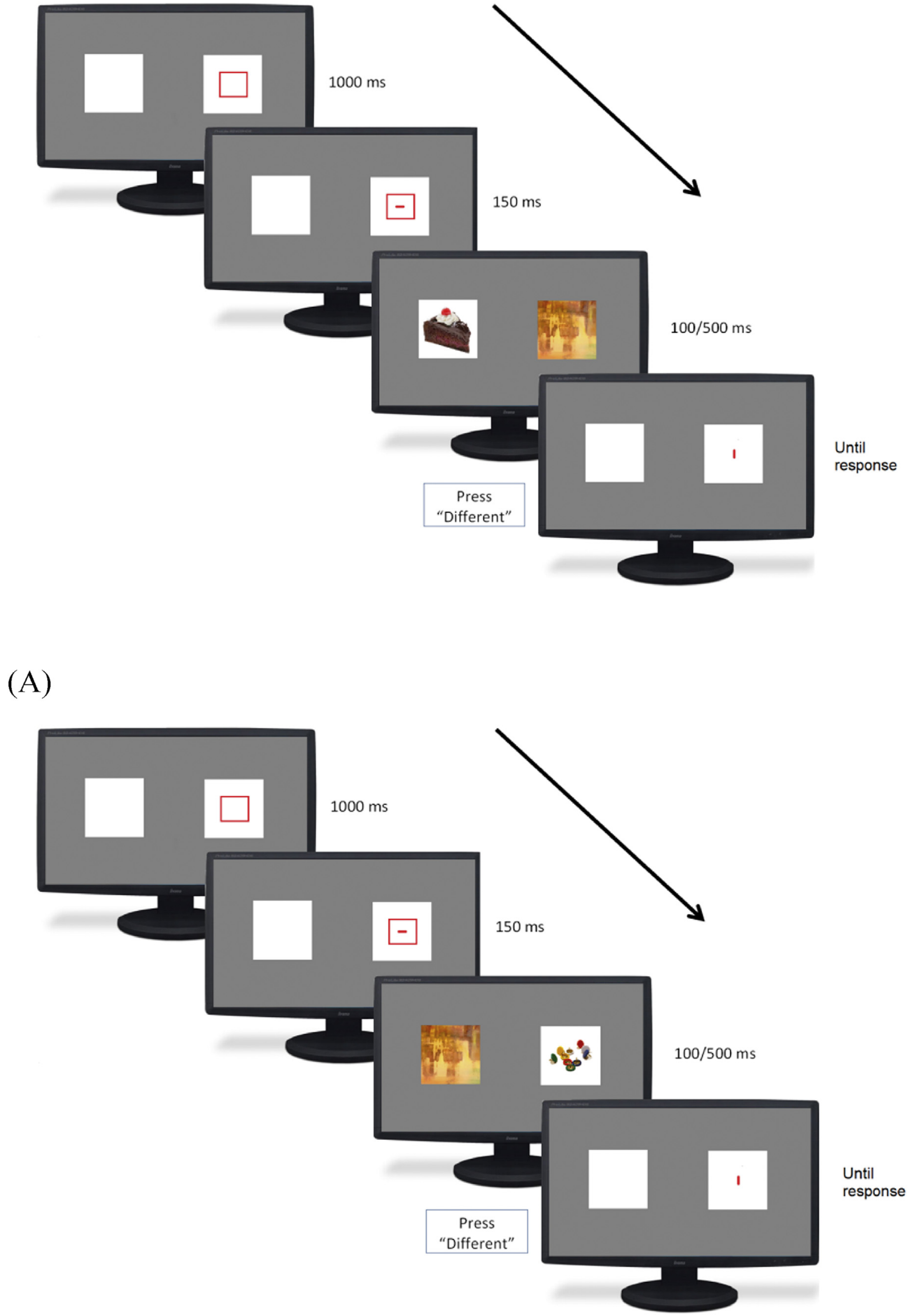

Fig. 1. Example of (A) a food trial where the food image appears distal to the anchor, the probe has a different position than the food image, and the orientation of the anchor and the probe is different; and (B) a neutral trial where the neutral image appears proximal to the anchor, the probe has a similar position as the neutral image, and the orientation of the anchor and the probe is different.

1. Method

1.1. Participants

Participants were 69 adolescents (67 females, $Mean_{age}$ = 15.55, SD_{age} = 1.70), who fulfilled DSM-5 criteria for Anorexia Nervosa Restrictive type (n = 39, *adjBMI* = 60.65–90.56), Anorexia Nervosa Binge Purge type (n = 10, *adjBMI* = 75.25–89.86), atypical Anorexia Nervosa Restrictive type (n = 11, *adjBMI* = 88.6–109.72), or atypical Anorexia Nervosa Binge Purge type (n = 9, *adjBMI* = 88.18–122.34), and were between 12 and 23 years of age. There were no additional inclusion or exclusion criteria. Of the initial 69 participants who were assessed at baseline 62 participants (90%) completed the EDE interview at follow-up, of which 60 participants completed the full follow-up assessment (87%).

1.2. Materials

1.2.1. Body mass index

Adjusted BMI was calculated [(actual BMI/Percentile 50 of BMI for age and gender) x 100] to make the BMI's comparable over the age range of group (Cole, Bellizzi, Flegal, & Dietz, 2000). The 50th percentile was obtained from the Netherlands Organization for Applied Scientific Research (TNO, 2010).

1.2.2. Eating disorder symptoms

Eating disorder symptoms were assessed with the Dutch child version of the Eating Disorder Examination (EDE) interview (Bryant-Waugh, Cooper, Taylor, & Lask, 1996; Decaluwé & Braet, 1999). During intake patients were diagnosed based on the EDE interview, which was therefore also used as post-measure of eating disorder pathology. An average score of the four subscales of the EDE - restraint, eating concern, weight concern, and shape concern - was used as general index of eating disorder symptoms. Additionally, a Dutch version of the Eating Disorder Examination Questionnaire 6.0 (EDE-Q) (Fairburn & Beglin, 2008) was used to assess self-reported eating disorder pathology. Adaptations were made to the wording of some items of the EDE-Q to make it appropriate for children and adolescents. These adaptations were made by the first and second authors and were comparable to adaptations that have been made to the previous version of the EDE-Q (Jansen, Mulkens, Hamers, & Jansen, 2007). An average score of the 22 items of the EDE-Q was used as a general index of eating disorder pathology (cf. Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012). The average score can range from 0 to 6, and the internal consistency of this total EDE-Q score at baseline and follow-up was excellent (Cronbach's alpha = .97 and .93 respectively).

1.2.3. State of food deprivation

Food deprivation was assessed with the question; "How long has it been since you last ate?" from the Hunger Scale (Grand, 1968). Scores reflect the number of hours that have passed since the participant last ate, rounded off to quarter hours.

1.2.4. Attentional bias to food

Attentional bias to food cues was measured with the Attentional Response to Distal vs. Proximal Emotional Information (ARDPEI) task (Grafton & MacLeod, 2014). Each trial started with two white squares, one left and one right from the middle of the screen, against a middle gray background. One of these squares contained a red outline to which participants had to focus their attention. This outline appeared with equal probability in either the left or the right white square. After a second a red horizontal or vertical line (the anchor) appeared for 150 ms in this red outline. Hereafter two images replaced the white squares for 100 ms (i.e., short cue delay) or 500 ms (i.e., long cue delay). These images were a food or neutral image (i.e., representational image) and an abstract art image. The images appeared with equal probability in either the right or left white square. Last, the probe – another red horizontal or vertical line – appeared on the left or right side of the screen. Participants were instructed to identify whether the probe had the same orientation as the anchor (i.e., both horizontal or both vertical) or a different orientation than the anchor (one horizontal and one vertical) by pressing the corresponding button on the USB response box. The probe remained on the screen until participants responded and a new trial started 1000 ms after the response. The task consisted of 128 trials and was programmed in E-prime 2.0 (Schneider, Eschman, & Zuccolotto, 2002). The task was performed on a HP Probook 650 G1 running Windows 7 on a 15-inch monitor (1366 × 768). Screen refresh rate was set at 60 Hz. See Fig. 1 for example trials. Stimuli at baseline and follow-up were the same and are described in Jonker et al. (2019).

1.2.5. Data reduction

Engagement bias for food images was calculated based on trials where participants had to look away from their initial focus point to see the image. The *engagement bias*, with higher scores reflecting facilitated attentional engagement with food stimuli, was calculated as follows: (mean RT for probes in different location as distal food image – mean RT for probes in same location as distal food image) – (mean RT for probes in different location as distal neutral image – mean RT for probes in same location as distal neutral image).

1.3. Procedure

This study was approved by the medical ethical committee of the University Medical Center in Groningen, the Netherlands (NL.51694042.14). The current study is part of a larger project on characteristics that might play a role in disordered eating behavior, and data of the baseline measure of this group have already been reported (Jonker et al., 2019; Jonker, Glashouwer, Hoekzema, Ostafin, & de Jong, 2020). The ARDPEI was the third performance measure during both baseline and follow-up.

Participants and their parents (when participants were younger than 18) signed informed consent forms and provided consent for use of the EDE information from the intake procedure, and participation in the baseline and follow-up measure. Baseline assessment took place a median of 53 days after intake. For most participants this means that baseline assessment took place at the start of treatment or up to 4 weeks after although a couple of patients participated later for reasons such as hospital admittance. Therefore, BMI during intake as well as during baseline assessment will be reported. Follow-up assessment took place approximately one-year after the baseline assessment (median 373 days after baseline). Patients who did not want to participate were asked for the reason and given the option to restrict participation to the interview part at follow-up. Patients who wanted to participate did so at the treatment center or during follow-up at their home if they preferred so (n = 2). Assessment was completed on the research laptop with the researcher present. Baseline and follow-up assessment followed roughly the same procedure, participants performed the ARDPEI and completed the EDE-Q. During follow-up the EDE interview was performed afterwards. Last, patients' height and weight were measured (see Fig. 2).

1.4. Analyses

Missing data assessment. Differences in baseline eating disorder symptoms, BMI, and attentional engagement between people who did and did not participate in the follow-up assessment were examined with independent samples t-tests.

Change between baseline and follow-up. Changes between baseline and follow-up in eating disorder symptoms, BMI, food deprivation, and AB were examined with paired samples t-tests. Bonferroni-Holm correction was applied to control for increased familywise error rate. Additionally, the relationship between the change in symptoms and

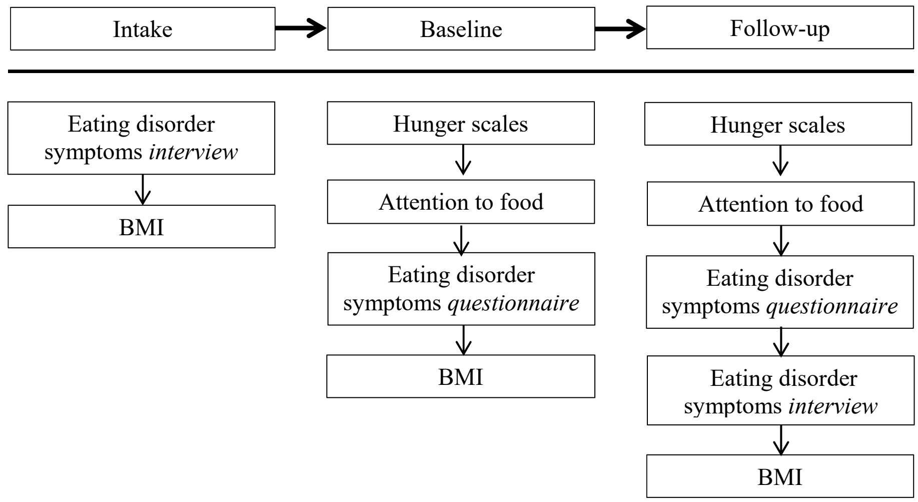

Fig. 2. Study design.

change in BMI (change = follow-up – baseline) was assessed with bivariate correlational analyses. Further, we tested whether the amount of days between baseline and follow-up assessment should be included as covariate in the analyses by examining its relation to change in eating disorder symptoms and BMI. Last, we examined the relationship between food deprivation and attentional engagement at baseline, and food deprivation and attentional engagement at follow-up.

Hypotheses testing. Linear regression analyses were conducted. Change in EDE (Model 1), EDE-Q (Model 2), or BMI (Model 3), was entered as dependent variable. In step 1 intake EDE score (Model 1), baseline EDE-Q score (Model 2), or baseline BMI (Model 3), was entered as control variable. To examine whether relatively weak engagement with food cues at baseline would be related to less improvement in symptoms of AN, baseline AB to food was entered as independent variable in step 2. To examine whether a reduction in symptoms of AN would be paralleled by an increase in visual attention to food cues from baseline to one-year follow-up, change in AB to food was added in step 3. All independent variables were centered before being entered in the models.

A Bonferroni-Holm correction was applied to control for increased familywise error rate. To complement the results of the statistical analyses following the common frequentist approach, results were also reported with the Bayesian approach. Bayesian analyses were conducted with JASP (JASP Team, 2018). Prior was set at the recommended default $r = 0.354$ (JASP Team, 2018). We will report BF_{10}, which quantifies the probability of the data under the model including the variable that was included in that step relative to the model without that variable. It thus provides the Bayesian equivalent to the *F*-change statistic.

2. Results

2.1. Data reduction

Outliers were deleted following Grafton and MacLeod (2014). Two participants were removed (48% and 63% correct responses) from the pre-test, of which one was also removed from follow-up (50.8%), because they fell more than 2.58 *SD* below the mean amount of correct responses. After removal, mean accuracy rate was 92% ($SD = 8\%$) at baseline, and 94% ($SD = 4\%$) at follow-up. Incorrect trials were deleted. Of the correct trials, 2.4% of baseline trials, and 2.3% of follow-up trials fell more than 2.58 *SD* from the mean reaction time for that trial type and were therefore eliminated from the data. Last, reaction times faster than 200 ms were deleted, since they are most likely anticipation errors. There was one participant who had such fast RTs during baseline (1.8% of the trials), and during follow-up only four trials (< 0.001%) contained reaction times faster than 200 ms.

2.2. Missing data assessment

Independent samples *t*-tests showed no significant differences on EDE ($t(12,28) = 1.39, p = .188$), EDE-Q ($t(65) = 1.80, p = .076$), BMI ($t(65) = 1.80, p = .077$), or attentional engagement ($t(63) = 0.11, p = .915$) on pre-test between people who did and did not participate in the follow-up of the study.

2.3. Change in symptoms, BMI and AB

Adolescents with AN showed a decrease in eating disorder symptoms between intake and follow-up as measured with the EDE and between baseline and follow-up as measured with the EDE-Q (Table 1). Further, they showed an increase in BMI between baseline and follow-up. There was no significant difference in food deprivation between baseline and follow-up assessment. Attentional engagement with food cues did not change between baseline and follow-up. Furthermore, similar to baseline (Jonker et al., 2019), attentional engagement with food cues at follow-up assessment did not deviate significantly from zero ($t(58) = -1.31, p = .194$), suggesting that patients did not show attentional engagement with food cues.

The relationship between change in BMI from intake to follow-up and change in EDE ($r = -0.27, p = .037$) was weak, and with change in EDE-Q ($r = 0.07, p = .594$) weak and non-significant. The amount of days between baseline and follow-up was not related to the change in EDE ($r = -0.12, p = .364$), EDE-Q ($r = 0.05, p = .715$), or BMI ($r = 0.14, p = .296$), and therefore this variable is not included in the analyses as covariate. Food deprivation at baseline was not related to attentional engagement at baseline ($r = -0.05, p = .697$), and food deprivation at post-test was not related to attentional engagement at post-test ($r = -0.13, p = .313$).

2.4. Hypotheses testing

Patients with more symptoms on the EDE at baseline showed a larger improvement over one year (Table 2, model 1 step 1). Interestingly, baseline EDE-Q scores were not predictive of change in eating disorder symptoms as measured with the EDE-Q, nor was baseline BMI predictive of change in BMI (Table 2, model 2 and 3 step 1).

Is a reduction in symptoms of AN paralleled by an increase in visual attention to food cues from baseline to one-year follow-up?

Change in eating disorder symptoms as measured with the EDE or

Table 1
Group characteristics.

	Intake (*N* = 69)		Baseline (*N* = 69)		Follow-up (*N* = 60)		Paired samples t-test			
	Mean	SD	Mean	SD	Mean	SD	t	p	Cohen's d	α
BMI	83.36	12.08	84.69	12.16			2.43	.018	0.29	.0083
			84.69	12.16	95.20[a]	15.03	7.37	< .001	0.97	.0071
EDE	3.74[b]	1.10			1.81[c]	1.51	−9.49	< .001	1.22	.0055
EDE-Q			4.16	1.11	2.57	1.58	−8.41	< .001	1.09	.0063
Food deprivation			3.91	7.63	2.19	3.35	−1.23	.194	0.17	.01
Engagement short			−14.65[b]	153.35	−22.31[d]	130.45	−0.29	.77	n.a.	.025
Engagement long			−13.87[b]	184.10	−2.73[d]	147.09	0.02	.98	n.a.	.05
Disengagement short			−28.97[b]	191.96	−8.03[d]	133.98	0.90	.37	n.a.	.0125
Disengagement long			−31.77[b]	181.01	10.46[d]	127.11	0.82	.42	n.a.	.0167

Note.
[a] BMI was available for 61 participants at posttest.
[b] EDE and attentional bias for food was available for 67 participants at pretest.
[c] EDE was available for 62 participants at follow-up, and.
[d] Attentional bias for food was available for 59 participants at follow-up. BMI = Adjusted Body Mass Index, EDE = Eating Disorder Examination interview, EDE-Q = Total score on the Eating Disorder Examination Questionnaire.

EDE-Q, and change in BMI were not paralleled by a change in attentional engagement with food cues (Table 2, model 1–3 step 3).

Is relatively weak attentional engagement with food cues at baseline related to less improvement in eating disorder symptoms and BMI from baseline to one year follow-up?

Baseline engagement bias with food was not predictive of change in eating disorder symptoms as measured with the EDE or EDE-Q, nor was it predictive of change in BMI (Table 2, model 1–3 step 2).

2.5. Post-hoc analyses

The sample included patients who were not underweight during baseline assessment, including patients with an atypical AN diagnosis for whom underweight is no requirement ($n = 14$) and patients who gained weight between intake and baseline assessment and as a result were above the underweight cut-off during baseline ($n = 8$). Because we expected that attentional engagement would facilitate food restriction in food deprived adolescents with AN, we performed post-hoc analyses including only patients who were underweight at baseline, and thus had to increase their food intake and weight (Table 3). The power of this analyses was 63% to find a medium effects size. There was no relation between change in AB and change in EDE, EDE-Q or BMI (Table 3, model 1–3 step 3). Furthermore, baseline engagement bias with food was not predictive of change in EDE-Q or BMI (Table 3, model 2–3, step 2). However, there was a non-significant trend suggesting that when baseline engagement with food was included in the model the explained variance of change in EDE increased (Table 3, model 1, step 2). The Bayes factor showed that there was anecdotal evidence that patients who had less attentional engagement with food cues showed less improvement in eating disorder symptoms.

3. Discussion

The major findings of the current study can be summarized as follows: (1) patients with AN showed on average an improvement in eating disorder symptoms and BMI after one year, whereas attentional engagement with food cues did not change during this period, (2) change in eating disorder symptoms was not related to change in attentional engagement with food cues, and (3) attentional engagement with food cues at baseline was not related to the change in eating disorder symptoms or BMI over the course of a year.

In a prior study, we found that patients with AN showed less attentional engagement with briefly (100 ms) presented food cues than adolescents without an eating disorder (Jonker et al., 2019). We expected that this lowered attentional engagement with food cues would be relevant for the persistence of AN, and examined whether

Table 2
Regression models of complete sample.

Model	Dependent	Step	Independent	β	T	R^2	F_{change}	p (F)	α	BF_{10}
1	Change in EDE	1	Baseline EDE	−0.39	−3.11**	0.15	9.68	.003	.0167	20.80
		2	Baseline EDE	−0.39	−3.10**	0.15	0.07	.789	.025	0.31
			Baseline engagement	−0.03	−0.27					
		3	Baseline EDE	−0.40	−3.04**	0.15	0.04	.844	.05	0.38
			Baseline engagement	−0.08	−0.30					
			Change in engagement	−0.05	−0.20					
2	Change in EDE-Q	1	Baseline EDE-Q	−0.25	−1.94	0.06	3.76	.057	.0167	1.56
		2	Baseline EDE-Q	−0.25	−1.94	0.06	0.07	.793	.05	0.35
			Baseline engagement	−0.03	−0.26					
		3	Baseline EDE-Q	−0.26	−2.00	0.07	0.49	.487	.025	0.51
			Baseline engagement	−0.20	−0.74					
			Change in engagement	−0.19	−0.70					
3	Change in BMI	1	Baseline BMI	−0.19	−1.41	0.03	1.98	.165	.0167	0.54
		2	Baseline BMI	−0.17	−1.29	0.06	1.75	.192	.025	0.77
			Baseline engagement	0.17	1.32					
		3	Baseline BMI	−0.16	−1.16	0.07	0.15	.700	.05	0.44
			Baseline engagement	0.27	0.96					
			Change in engagement	0.11	0.39					

Note. **$p < .01$, $n_{Model1} = 57$, $n_{Model2} = 59$, $n_{Model3} = 58$, Negative change in EDE and EDE-Q symptoms means an improvement, Positive change in BMI means an improvement.

Table 3
Regression models of patients who were underweight at intake.

Model	Dependent	Step	Independent	β	T	R^2	F_{change}	p (F)	α	BF_{10}
1	Change in EDE	1	Baseline EDE	−0.38	−2.29*	0.14	5.25	.029	.0167	2.44
		2	Baseline EDE	−0.45	−2.80**	0.25	4.47	.043	.025	2.04
			Baseline engagement	−0.34	−2.12					
		3	Baseline EDE	−0.45	−2.83**	0.27	1.00	.325	.05	0.60
			Baseline engagement	−0.56	−2.05*					
			Change in engagement	−0.27	−1.00					
2	Change in EDE-Q	1	Baseline EDE-Q	−0.34	−2.10*	0.11	4.41	.043	.0167	2.07
		2	Baseline EDE-Q	−0.40	−2.45*	0.17	2.19	.149	.05	0.90
			Baseline engagement	−0.24	−1.48					
		3	Baseline EDE-Q	−0.40	−2.50*	0.22	2.20	.148	.025	1.00
			Baseline engagement	−0.60	−2.07*					
			Change in engagement	−0.42	−1.48					
3	Change in BMI	1	Baseline BMI	−0.09	−0.50	0.01	0.25	.618	.05	0.35
		2	Baseline BMI	−0.07	−0.39	0.08	2.69	.110	.0167	1.19
			Baseline engagement	0.27	1.64					
		3	Baseline BMI	−0.02	−0.11	0.10	0.62	.436	.025	0.61
			Baseline engagement	0.49	1.52					
			Change in engagement	0.26	0.79					

Note. $^{**}p < .01$, $^{*}p < .05$, $n_{Model1} = 34$, $n_{Model2} = 36$, $n_{Model3} = 36$, Negative change in EDE and EDE-Q symptoms means an improvement, Positive change in BMI means an improvement.

improvement of AN symptoms would be paralleled by an increase in this attentional engagement with food cues. Adolescents with AN showed a substantial improvement in symptoms and BMI from baseline to follow-up. Nevertheless, their low attentional engagement with food cues remained unchanged. Furthermore, we failed to find evidence for a relationship between change in eating disorder symptoms or BMI and a change in attentional engagement with food cues in adolescents with AN. This was the case for the full sample as well as a subsample of only adolescents who were underweight at baseline. In sum, the current study does not support the idea that improvement of AN symptoms and BMI is related to an increase of attentional engagement with food cues.

As a second approach we tested whether a relatively weak attentional engagement with food cues at baseline would be related to less improvement in eating disorder symptoms and BMI over the course of a year. In the full sample of patients with AN, attentional engagement with food cues was not predictive of change in eating disorder symptoms or BMI. Yet, in the underweight subsample, there was a trend for the expected relationship in that low attentional engagement with food cues at baseline was related to less improvement on eating disorder symptoms. However, the Bayes factor showed that the evidence for this relationship was anecdotal. Taken together with the relatively small sample size that remained after exclusion of patients with a healthy weight at baseline, this finding needs replication before solid conclusions can be drawn.

The present study has several strengths. Importantly, a large number of adolescents with AN was included, a prospective approach was taken to examine the relationship between attention to food and eating disorder symptoms, drop-out rates were relatively low and change in eating disorder symptoms was assessed not only with a self-report questionnaire, but also with an interview. In addition to the study strengths, there are a couple of limitations. First, because adolescents with AN received treatment as usual, diversity in treatment content and targets might have resulted in noise that lowered the chance to find a relationship between attention for food and change in eating disorders and BMI. Second, a relatively new and not fully validated attentional bias measure was used. Internal consistency of the ARDPEI could not be assessed in the current study because of the restricted number of trials based on the balance between obtaining an accurate reflection of performance and time-efficiency/strain on participants. Additionally, test-retest reliability of this task is not known and could not be examined because of the uncontrolled period between baseline and follow-up. To meaningfully examine the course of AB with the ARDPEI, stability of the AB index is crucial and should therefore be examined in future studies. Nevertheless, attesting to its validity the current measure of engagement bias for briefly shown food images successfully differentiated between individuals with and without AN (Jonker et al., 2019), as well as between healthy weight individuals with and without food deprivation (Jonker, Bennik, et al., 2020). Last, hunger levels were not under experimental control which might have influenced the results. However, at baseline food deprivation in adolescents with AN was longer than in adolescents without an eating disorder who did show attentional engagement with food cues (Jonker et al., 2019). Furthermore, food deprivation before baseline and follow-up did not significantly differ. Thus, the absence of a difference in attentional engagement with food cues between baseline and follow-up cannot be explained by less food deprivation during follow-up that could have masked an increase in attentional engagement between baseline and follow-up.

To conclude, the current study showed no evidence indicating that the improvement of eating disorders symptoms and BMI of adolescents with AN was related to an increase in attentional engagement with food cues. Further, the study failed to provide strong evidence that a lack of attentional engagement with food cues is prospectively related to the persistence of AN. All in all, the current findings provided no evidence to support the view that attentional engagement with food is critically involved in the persistence of AN.

Author contribution statement

N. C. Jonker Conceptualization, methodology, software, formal analysis, investigation, data curation, writing – original draft, writing – review & editing, project administration, funding acquisition. **K. A. Glashouwer** Conceptualization, methodology, resources, writing – review & editing, supervision. **B. D. Ostafin** Conceptualization, methodology, writing – review & editing, supervision. **P. J. de Jong** Conceptualization, methodology, writing – review & editing, supervision, funding acquisition.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2020.103649.

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