Received: 1 July 2020 | Revised: 22 January 2021 | Accepted: 23 January 2021

DOI: 10.1002/eat.23482

ORIGINAL ARTICLE

International Journal of EATING DISORDERS WILEY

Relationships between educational achievement, intelligence, and perfectionism in adolescents with eating disorders

Christina M. T. Schilder PhD[1] | Lot C. Sternheim PhD[2] | Emmeke Aarts PhD[3] | Annemarie A. van Elburg MD, PhD[1,2] | Unna N. Danner PhD[1,2]

[1]Altrecht Eating Disorders Rintveld, Zeist, The Netherlands

[2]Department of Clinical Psychology, Utrecht University, Utrecht, The Netherlands

[3]Department of Methodology and Statistics, Utrecht University, Utrecht, The Netherlands

Correspondence
Christina M. T. Schilder, Altrecht Eating Disorders Rintveld, Wenshoek 4, 3705 WE Zeist, The Netherlands.
Email: c.schilder@altrecht.nl

Action Editor: Ruth Weissman

Abstract

Objective: High performance at school is associated with the risk of eating disorders (EDs), and perfectionism is proposed as an explanatory factor for this association. This study aims to evaluate (a) potential discrepancies between the measured IQ of adolescents with EDs and the IQ that is expected given their educational track, and (b) to what extent perfectionism was associated with educational achievement independent from IQ.

Method: WISC-III Verbal IQ, Performance IQ, and Full Scale IQ of 386 adolescent ED patients were compared with population norms for their educational track, using one-sample *t* tests. The association between self-oriented perfectionism (Eating Disorder Inventory-2) and educational achievement, adjusted for IQ, was determined with sequential ordinal regression analyses.

Results: Over 50% of the patients received pre-university education, the most complex educational track. For patients receiving education in the second most complex track, IQ-scores were lower than normative data for that track. For patients receiving pre-university education, the verbal IQ was lower than the norm for that track. Self-oriented perfectionism was associated with educational achievement independent from intelligence.

Discussion: This study suggests that high educational achievement is common in adolescents with EDs. Particularly for patients who receive education in the most complex tracks the demands at school may be higher than they can handle, based on their IQ. Self-oriented perfectionism contributed to educational achievement independent from IQ. Our results indicate that treatment for EDs should include awareness for the possibility of a too high target level of patients at school and perfectionism.

KEYWORDS

adolescent, anorexia nervosa, bulimia nervosa, education, feeding and eating disorders, intelligence, perfectionism

1 | INTRODUCTION

In the clinical practice of eating disorder (ED) treatment, therapists often observe that adolescent patients attach great importance to school work and have a preference for a challenging curriculum at school. This observation is in line with earlier research which showed that indicators for high educational performance such as performance on the official school exams (Toro et al., 1995) and the educational

level (Sundquist, Ohlsson, Winkleby, Sundquist, & Crump, 2016) indeed are factors that are associated with more frequent occurrence of EDs. Even higher education of the parents and grandparents of patients (Goodman, Heshmati, & Koupil, 2014; Sundquist et al., 2016) and attending a school where fellow students have highly educated parents (Bould et al., 2016) are associated with a more frequent occurrence of EDs.

A higher than average intelligence, as is established in a review and our earlier work ((Lopez, Stahl, & Tchanturia, 2010; Schilder et al., 2017) might be an explanatory factor for the high educational aspirations and achievements of ED patients. Nevertheless, therapists regularly have the impression that the educational achievement of their patients is higher than would be expected given their intellectual capacities. Preliminary evidence for such a "mismatch" between educational achievement and intellectual capacities was found in an early study in which patients with an ED had higher school performance than was predicted based on their IQ (Dura & Bornstein, 1989). To our knowledge, the existence of, and explanation for such a "mismatch" is hardly been investigated since. Perfectionism might be an additional explanatory factor for educational achievement in ED patients, as it is an important factor underlying school achievement (Stoeber, Haskew, & Scott, 2015) and common in patients with ED (Norris, Gleaves, & Hutchinson, 2019).

In the present study, we extended upon earlier work in which we found higher IQs than population norms in patients with EDs (Schilder et al., 2017). Our study aims were to investigate (a) whether discrepancies exist between their measured IQ and the IQ that matches with the track of secondary education they receive, and (b) to what extent perfectionism was associated with educational achievement independent from (the well-known and strong predictor) intelligence. Since the Dutch school system has clearly distinct tracks which differ in degree of complexity and the allocations of pupils to secondary education are based on achievements in primary school, the Dutch situation provides the unique opportunity to evaluate these associations closely.

2 | METHODS

2.1 | Patients

Included were 386 adolescents with an ED who were referred to Altrecht Eating Disorders Rintveld in Zeist, the Netherlands, and had undergone psychological assessments including the Dutch Wechsler Intelligence Scale for Children, third version (WISC-III Dutch version) (Wechsler, 2002) and the Eating Disorder Inventory, second edition (EDI-2) (van Strien, 2002) in the period 2007–2017. The sample of patients included 263 out of 290 adolescents of our previous study (Schilder et al., 2017), 27 patients of the previous study were excluded because of missing data for the present study (N = 21) or outlying high body mass index (BMI) (n = 6). The sample was expanded with 123 patients who had a psychological assessment since the previous study. Rintveld is a nationwide tertiary referral center for ED patients and offers diagnostic assessments, consultation, and personalized treatment for in- and outpatients. The psychological assessment was for clinical purposes routinely performed by qualified psychodiagnostic workers and scheduled shortly after completion of the initial assessment procedure. WISC-III and EDI-II were both part of the same psychological assessment. The ED was established by ED experts (medical doctors or clinical psychologists) and confirmed by the Eating Disorder Examination (Fairburn & Cooper, 1993). Included were patients with anorexia nervosa (AN), bulimia nervosa (BN), eating disorder not otherwise specified (EDNOS, for patients who had their classification prior to the introduction of the DSM-5), and other specified feeding or eating disorder (OSFED, for patients who had their classification after the introduction of the DSM-5). Patients with a DSM-IV classification EDNOS who fulfilled, in retrospect, DSM-5 AN or BN criteria but did not fulfill the DSM-IV criteria with respect to amenorrhea (for AN) or to the frequency of binges or purging behavior (for BN), were assigned to the AN and BN patient groups, respectively. The remaining DSM-IV EDNOS cases were classified as OSFED. The group consisted of 379 girls and 7 boys. Three hundred and forty four (89.1%) patients were diagnosed with AN, 14 (3.6%) with BN, and 28 (7.3%) with OSFED. The mean BMI at the time of the psychological assessment was 16.9 (SD 2.0, range 12.5–25.6, median 16.8). All were between 12 and 16 years of age and were attending a school in the Netherlands. The Institutional Review Board of Altrecht Mental Health Institute approved the study. All study information was retrospectively extracted from the medical files and analyzed anonymously.

2.2 | Measures

2.2.1 | Intellectual functioning

The Wechsler Intelligence Scale for Children, third version (WISC-III), adjusted for use in the Dutch language and provided with Dutch age-adjusted norms (Wechsler, 2002) was used to measure intelligence. The quality of the norms of the Dutch version, as well as its reliability and validity (construct validity), was judged to be satisfactory (Evers, Van Vliet-Mulder, & Groot, 2000). The WISC-III comprises a number of subtests from which a full scale IQ, a verbal IQ, and a performance IQ was derived. Because the verbal IQ and the performance IQ might be differentially associated with the level of education (Roth et al., 2015), we used the verbal IQ and the performance IQ distinctly in our analysis.

2.2.2 | Perfectionism

Data on self-reported perfectionism were derived from the Perfectionism subscale (EDI-P) of the Dutch version of the Eating Disorder Inventory-2 (EDI-II-NL) (van Strien, 2002). The EDI-P comprises six questions which are rated on a 6-point scale (ranging from "always" to "never"). Originally, the subscale was construed as a unidimensional

TABLE 1 Tracks of secondary education in the Netherlands, scores on international classification systems, and comparison with U.S. diplomas

	NLQF	EQF	ISCED	Comparable diplomas in United States
Track 1: VMBO b, k, and g	1–2	1–2	2	General educational development
Track 2: VMBO-t	2	2	2	General educational development-high school
Track 3: HAVO	4	4	2–3	High school
Track 4: VWO	4+	4	2–3	High school-associates degree (transfer program)

Abbreviations: EQF, European Qualification Framework (CEDEFOB, 2020); HAVO, Hoger Algemeen Voortgezet onderwijs (senior general secondary education); ISCED, International Standard Classification of Education (ISCED, n.d.); NLQF, Netherlands Qualifications Framework (Dutch Qualification Framework (NLQF), 2018); VMBO b, k, and g, Voorbereidend middelbaar beroeps onderwijs, basis, kader, gemengd (preparatory secondary vocational education basic vocational track, advanced vocational track, combined track); VMBO-t, Voorbereidend middelbaar beroeps onderwijs (preparatory secondary vocational education theoretical track); VWO, Voorbereidend Wetenschappelijk onderwijst (pre-university education).

measure of perfectionism. However, research in both clinical and non-clinical samples suggests that the EDI-P measures two dimensions of perfectionism: self-oriented perfectionism (the belief that perfection is required in personal performance) and socially prescribed perfectionism (the belief that perfection in personal performance is expected by others) (Lampard, Byrne, McLean, & Fursland, 2012; Sherry, Hewitt, Besser, McGee, & Flett, 2004). The internal consistency of the self-oriented perfectionism subscale (three items) was rated as good (Cronbach's α: .84–.89); of the socially prescribed perfectionism subscale (three items) acceptable: .69–.83) (Lampard et al., 2012).

In the present study, the Cronbach's α of the self-oriented perfectionism subscale of the EDI-P was .83, which indicate a good internal consistency. However, the Cronbach's α of the socially prescribed perfectionism subscale was insufficient (.53). Because of this insufficient internal consistency, and because in earlier research self-oriented perfectionism was found more relevant for educational achievement than socially prescribed perfectionism (Dykstra, 2007; Harper, Eddington, & Silvia, 2016; Stoeber, 2012; Stoeber et al., 2015), only the (three-item) self-oriented perfectionism subscale was used in this study.

2.2.3 | Educational achievement

Educational achievement was defined by the track of secondary education that the patients followed at the time of the psychological assessment, according to the Dutch education system (Nuffic, n.d.). The Dutch education system consists of 8 years of primary education (starting at 4 years of age) followed by distinct tracks of secondary education with different levels of complexity. Allocation to the different tracks is based on achievement in primary school and a central end test. For the present study, the classification that is used in the WISC-III manual was used. In short, Track 1 and 2 represent prevocational education. This type of education lasts 4 years and combines vocational training with theoretical education. Track 2 has a larger share of theoretical education than Track 1. After finishing Track 1 or 2, pupils can take secondary vocational training in which they learn a practical trade. Track 3 represents senior general secondary education. It lasts 5 years and provides access to universities of applied sciences. Track 4 is pre-university education. It provides admission to research universities and lasts 6 years. In many schools, education is in the first 1 or 2 years offered in "transition classes" in which tracks are combined. After these 1 or 2 years, the pupil chooses the track with the most appropriate level of complexity.

Table 1 shows the Dutch names and abbreviations of the educational tracks. Moreover, to enable comparison with other school systems over the world, for each school track scores according to different international qualification systems are given, as well as comparison with the U.S. diplomas that can be obtained.

For this study, in case patients were attending a "transitional class," the lowest track was used (n = 12). In case the assessment was done during summer holidays, the educational track they would attend after holiday was used (n = 20). In one case, the patient was not able to attend school because of the severity of the ED, the educational track that was last attended was used in the analysis.

2.3 | Statistical analysis

The Statistical Package for Social Sciences (SPSS) 22.0 was used for all analyses. Frequencies and descriptives were used to determine the distribution of patients across the four tracks of secondary education and sociodemographic information. Differences between the mean full scale IQ, verbal IQ, and performance IQ of our patients with published IQ norms for the educational track they attended were tested by means of one-sample t tests. Effect sizes were determined by Cohen's d: a Cohen's d of 0.2 is regarded as small, of 0.5 as medium and of 0.8 as large (Cohen, 1988). For the determination of the strength of associations between (subsequently) verbal IQ, performance IQ, self-oriented perfectionism, and the educational track while adjusting for associations earlier in the sequence, a sequential ordinal regression analysis was conducted. The quality of the model was evaluated using the R(2) (Nagelkerke). To prevent the models from becoming unstable or unreliable because of empty cells (combinations of scores that do not appear in the data), we transformed the continuous variables verbal IQ, performance IQ, and self-oriented perfectionism transformed into categories. Both IQ measures were transformed into three categories (<85, 85–114, >114), the self-oriented perfectionism scale was transformed into four categories (raw scores 3–6, 7–10, 11–14, and 15–18, respectively). Furthermore, the educational Tracks 1 and 2 were combined. In the first of the sequential ordinal regression

TABLE 2 Clinical characteristics of patients (*n* = 386)

Age (*SD*) (years)	14.69 (1.15)
Range in years	12–16
Girls, *N* (%)	379 (98.1)
Boys, *N* (%)	7 (2.9)
Anorexia nervosa, *N* (%)	344 (89.1)
Bulimia nervosa, *N* (%)	14 (3.6)
Other specified feeding or eating disorder, *N* (%)	28 (7.3)
WISC-III full scale IQ; mean (*SD*); median	105.2 (15.9); 106
WISC-III verbal IQ; mean (*SD*); median	106.7 (15.2); 107
WISC-III performance IQ; mean (*SD*); median	102.0 (16.0); 102
Self-oriented perfectionism (EDI-SOP) (*SD*); median	10.5 (3.9); 10

Abbreviations: EDI-SOP, Eating Disorder Inventory-self oriented perfectionism; IQ, intelligence quotient; WISC-III, Wechsler Intelligence Scale for Children, third version.

analysis, the verbal IQ was used as the independent variable, in the second the verbal IQ and the performance IQ and in the third the verbal IQ, the performance IQ, and self-oriented perfectionism. Then, the −2 Log Likelihoods of the three sequential ordinal regression analyses were compared with Chi-square tests to determine the independent contribution of the performance IQ and self-oriented perfectionism to the educational track. Two-sided *p* values of <.05 were considered as statistically significant.

3 | RESULTS

3.1 | Clinical and sociodemographic characteristics of the patients

Tables 2 and 3 show the age of the patients, mean IQ, and perfectionism scores. The AN, BN, and OSFED group did not differ significantly with respect to IQ, the educational track they were attending, perfectionism, nor in age. Fifty-one percent of the patients (*N* = 197) were attending the most complex track in the Dutch education system: preuniversity education (Track 4). Twenty-seven percent (*N* = 105) were attending senior general secondary education (Track 3). The two least complex educational tracks (preparatory secondary vocational education) were attended by 15% (Track 2, *N* = 58) and 7% (Track 1, *N* = 26) of the patients.

3.2 | Comparisons of verbal IQ, performance IQ, and full scale IQ between ED patients and published IQ norms across the four educational tracks

For Track 1, the least complex educational track, the verbal IQ of our patients was significantly higher than the norms for that track (based on the WISC-III validation sample). The effect size of the difference was small to medium. The verbal IQ, performance IQ, and full scale IQ of the patients who receive education in Track 2 matched with the normative data for that track. For patients who receive education in Track 3, the verbal IQ, performance IQ, and full scale IQ were, on average, lower than the norms for that track. For the performance IQ and full scale IQ, the effect sizes of the difference were small to medium. For the most complex educational track (Track 4), the verbal IQ of the patients was, on average, significantly lower than the norms for that track, with a small effect-size (Table 4).

TABLE 3 Number of cases in the self-oriented perfectionism categories in the four educational tracks

	Category of EDI-SOP based on raw scores	*N* (% of patient in track)
Track 1	EDI-SOP 3–6	6 (23.1)
	EDI-SOP 7–10	10 (38.5)
	EDI-SOP 11–14	8 (30.8)
	EDI-SOP 15–18	2 (7.7)
Track 2	EDI-SOP 3–6	13 (22.4)
	EDI-SOP 7–10	24 (41.4)
	EDI-SOP 11–14	15 (25.9)
	EDI-SOP 15–18	6 (10.3)
Track 3	EDI-SOP 3–6	20 (19.0)
	EDI-SOP 7–10	36 (34.3)
	EDI-SOP 11–14	31 (29.5)
	EDI-SOP 15–18	18 (17.1)
Track 4	EDI-SOP 3–6	23 (11.7)
	EDI-SOP 7–10	68 (34.5)
	EDI-SOP 11–14	64 (32.5)
	EDI-SOP 15–18	42 (21.3)

Abbreviation: EDI-SOP, Eating Disorder Inventory-self oriented perfectionism.

3.3 | Relative contributions of intelligence and self-oriented perfectionism to educational achievement

As expected, IQ was a strongly associated with the educational track. The verbal IQ had the strongest association and explained 26.9% of the variance [$X^2(2) = 103.17$, $p < .001$; Nagelkerke's $R^2 = .27$]. Performance IQ contributed significantly to the model and explained an extra 4% of the variance [$X^2(1) = 17.64$, $p < .001$; Nagelkerke's $R^2 = .31$]. After adjusting for verbal IQ and performance IQ, self-oriented perfectionism explained an extra 2.4% of the variance in the educational tracks [$X^2(1) = 11.20$, $p < .001$; Nagelkerke's $R^2 = .33$] (Table 5).

4 | DISCUSSION

In the current study, the match between educational achievement of adolescents with EDs and their intelligence, and associations between

TABLE 4 Comparisons of VIQ, PIQ, and FSIQ between ED patients and normative group across the four educational tracks

Track 1: Preparatory secondary vocational education (other tracks) (VMBO bb, k, g)						
	Patients (*n* = 26)	Normative group (*n* = 36)	*t*-score	*df*	*p* value	Cohen's *d*
VIQ (*SD*)	85.6 (8.7)	81.1 (14.7)	2.62	25	.02	0.37
PIQ (*SD*)	86.7 (12.3)	85.3 (15.3)	0.56	25	.58	0.10
FSIQ (*SD*)	84.4 (9.6)	81.3 (13.5)	1.66	25	.11	0.26
Track 2: Preparatory secondary vocational education-theoretical track (VMBO-t)						
	Patients (*n* = 58)	Normative group (*n* = 115)	*t*-score	*df*	*p* value	Cohen's *d*
VIQ (*SD*)	92.6 (9.2)	91.9 (11.1)	0.54	57	.59	0.07
PIQ (*SD*)	92.8 (14.7)	94.1 (12.9)	−0.69	57	.50	0.09
FSIQ (*SD*)	91.7 (11.4)	92.0 (11.7)	−0.23	57	.82	0.03
Track 3: Senior general secondary education (HAVO)						
	Patients (*n* = 105)	Normative group (*n* = 76)	*t*-score	*df*	*p* value	Cohen's *d*
VIQ (*SD*)	103.8 (10.7)	106.1 (10.4)	−2.24	104	.03	0.22
PIQ (*SD*)	99.7 (12.8)	106.0 (12.4)	−5.02	104	<.001	0.49
FSIQ (*SD*)	102.1 (11.0)	106.9 (10.6)	−4.5	104	<.001	0.44
Track 4: Pre-university education (VWO)						
	Patients (*n* = 197)	Normative group (*n* = 70)	*t*-score	*df*	*p* value	Cohen's *d*
VIQ (*SD*)	115.2 (12.9)	117.2 (11.3)	−2.24	196	.03	0.16
PIQ (*SD*)	107.9 (15.5)	109.2 (12.6)	−1.14	196	.26	0.09
FSIQ (*SD*)	113.7 (13.9)	115.6 (11.8)	−1.96	196	.05	0.15

Abbreviations: ED, eating disorder; FSIQ, full scale IQ; HAVO, Hoger Algemeen Voortgezet onderwijs (senior general secondary education); PIQ, performance IQ; VIQ, verbal IQ.

TABLE 5 Associations between of intelligence and perfectionism and educational achievement

	Model 1: VIQ	Model 2: VIQ + PIQ	Model 3: VIQ + PIQ + SOP
LL intercept only	793.27	793.27	793.27
LL final	690.10	672.47	661.27
Difference		17.64	11.20
p of the difference		<.001	<.001

Abbreviations: LL, −2Log likelihood; PIQ, performance IQ; SOP, self-oriented perfectionism; VIQ, verbal IQ.

intelligence, self-oriented perfectionism and educational achievement were examined. In our patient group, more than 50% of the patients were receiving pre-university education, the most complex track in the Dutch school system. Particularly for patients receiving education in the second most complex track, the average IQs were lower than the norm for that educational track. To a lesser extent, this was also the case for patients who received pre-university education (Track 4, the most complex track). Self-oriented perfectionism was, independent from IQ, associated with educational achievement.

The observation in our study sample that more than 50% of the patients were receiving pre-university education is remarkable. This proportion is higher than the proportion of the pupils in the general population in the Netherlands, of which approximately 24% receives pre-university education (in 2010; Centraal Bureau voor de Statistiek, Dienst Uitvoering, & Ministerie van onderwijs, 2019). Because our study is done in a single eating disorder center, this observation cannot be generalized to all adolescents with EDs. Moreover, due to the specific education system in the Netherlands, these results cannot easily be compared with other (non-Dutch) studies, but earlier studies demonstrated associations between other indicators for higher educational achievement (i.e., school grades) and EDs (Sundquist et al., 2016; Toro et al., 1995). The mechanisms by which EDs and school achievement are associated with each other are not well established. Higher intelligence in ED patients is a potential factor of importance (Lopez et al., 2010; Schilder et al., 2017). The present study adds perfectionism as an independently contributing factor. The choice for the more complex, theoretical educational tracks of many patients in the present study might suggest that academic achievement is not hampered as a result of the ED. However, this conclusion would be premature. We considered the current educational

achievement of the patients, but had no information about delay due to missed lessons because of the ED, and graduation rates. Earlier studies show that having an ED interferes with educational activity (Godart et al., 2004). Studies on long-term educational and occupational outcome revealed mixed results: in a Finnish population cohort study (Mustelin et al., 2015), women with a history of AN closely resembled their unaffected peers in terms of education and employment. In contrast, in a multisite international study, women with an ED in their medical history appeared to be less educated (i.e., a higher percentage did not graduate high school and a lower percentage did earn a graduate degree or professional training) than sex- and age-matched controls (Maxwell et al., 2011). Duration of illness and age of onset were associated with educational attainment in that study.

Lower measured IQs than expected IQs (based on the normative data of the WISC-III for the different tracks) were present for the two most complex educational tracks, concerning 78% of the pupils. Particularly, patients receiving senior general secondary education (Track 3), had on average lower IQs than published norms for that particular track. The largest discrepancy was seen for the performance IQ, with a small-to-medium effect size. For the patients receiving pre-university education (Track 4), differences between the IQ scores and published norms for that educational track had a small effect-size, which suggests no major discrepancies between their measured intellectual capacities and those that are expected for their track. To our knowledge, up till now, in only one small study discrepancies between school performance and IQ in patients with an ED were evaluated (Dura & Bornstein, 1989). In that study, school achievement (measured with the Wide Range Achievement Test) was found to be significantly higher than would be predicted by IQ scores. It could be argued that the discrepancy between the measured IQ and expected IQ might be partly explained by the negative influence of the ED on performance, due to low energy or concentration problems, resulting in temporarily lowered test scores. However, in an earlier study (Schilder et al., 2017), we did not find any relationships between BMI, duration of the disorder, and psychological severity (EDI-2 total score) with intelligence scores in adolescent ED patients, making such an explanation less plausible. Interestingly, for the least complex track (Track 1), a higher verbal IQ than expected for that track was found. Although this finding is based on comparison of two small groups, it suggests that although many adolescents with ED follow an educational track that either suits with, or is above their intellectual capacities, a smaller group of patients follows an educational track that is less complex than would be appropriate for her capacities. This might especially be the case for the patients who receive education in the least complex educational tracks.

As expected, intelligence was strongly associated with educational achievement, explaining 31% of the variance. This finding is in concordance with research in healthy adolescents in which was found that intelligence is strongly associated with academic achievement and attained level of education (Deary, Strand, Smith, & Fernandes, 2007; Roth et al., 2015). We found that the verbal IQ had the strongest association with educational achievement, and that the performance IQ contributed significantly to the explained variance of the educational achievement. These results are in line with the meta-analysis of Roth et al. (2015), who concluded that scores on verbal or mixed intelligence tests were stronger correlated with school grades than did nonverbal intelligence tests. According to these authors, an explanation might be that verbal skills (e.g., speech comprehension, linguistic expression) are of particular importance for the successful participation in class as well as in written exams.

Self-oriented perfectionism was associated with educational achievement, also after adjustment for the effect of intelligence. Although the amount of explained variance was small (2,4%), this suggests that inner strivings for perfection can have additional enhancing effects on the educational level independent from the effect of IQ. This result suits with earlier research in healthy adolescent pupils in which higher self-oriented perfectionism was associated with higher school grades (Dykstra, 2007). Because we measured self-oriented perfectionism only with a three-item subscale, our results must be considered as preliminary and require replication. Moreover, our measure for perfectionism does not cover all different features of perfectionism that are considered important (particularly the adaptive and maladaptive dimensions) (Haynos et al., 2018; Hewitt & Flett, 1991; Stoltz & Ashby, 2007). In the context of school performance of patients with EDs, this would be a valuable distinction. After all, in earlier research in healthy adolescents it is argued that positive effects of perfectionism such as high academic achievement only occur when a perfectionist is not overly concerned with mistakes and negative evaluation (Stoeber & Otto, 2006). Future research considering adaptive and maladaptive perfectionism in relation to school performance in ED patients could add to the knowledge about this topic. Due to the cross-sectional nature of this study, it cannot be determined whether educational achievement is a cause or a consequence of perfectionism. Damian, Stoeber, Negru-Subtirica, and Baban (2017) demonstrated that, in healthy adolescents, perfectionism and academic achievement affect each other mutually as academic achievement was both an antecedent and an outcome of perfectionistic strivings and concerns.

Intelligence and perfectionism explained one third of the variance in the educational level, which means that a substantial part of the variance remains unexplained. Speculatively, personality traits such as obsessive–compulsive traits (Halmi, 2004) and persistence (Fassino, 2002), which are common in ED patients and are often observed with regard to their school work, might contribute to the explanation. Apart from personal characteristics of the ED patients, other factors may be important in the decision of placing a patient in a particular educational track (which may or may not match with intellectual capacity). Familial factors might be important, for example, the highest education of the parents, the importance attached to school performance in the family, family income, number of siblings, or placement of siblings in a given track. In addition, characteristics of the elementary school, such as teaching methods, number of pupils in a class, and possibilities for personal guidance during schoolwork might also influence the choice for the educational track in secondary school. Future research considering familial, elementary school-related, and other

factors might increase our understanding of the choice for the educational track and the match with intellectual capacities.

A strength of this study is the large sample of 386 participants. Furthermore, the Dutch system of secondary education with tracks that clearly differ in complexity and allocation of pupils based on the achieved grades in primary school, provided the opportunity to study relationships between level of education, intelligence, and perfectionism closely. A limitation of this study is that the observed large proportion of higher educational tracks in our sample may be influenced by selection bias. After all, it is possible that families with a higher socioeconomic status might be more aware of the treatment options or, for example, have easy access to transportation to the center. As a result, patients from families from higher socioeconomic classes might be overrepresented in our study sample. However, we believe that selection bias in our study was limited, because ED treatment in the Netherlands is covered by the basic level of health insurance that is mandatory for all its citizens, and access to healthcare in the Netherlands is considered to be easy attainable for those who seek help (Heijink, Zwakhals, Verkleij, & Westert, 2010). Furthermore, our center is a nationwide tertiary referral center for complex and severe EDs and has treatment options for patients/families regardless of the level of intelligence or education. Other limitations of this study include the cross-sectional nature which prohibit the determination of causal relationships between intelligence, perfectionism, and level of education. Also, we had no information on the impact of the ED on graduation rates and subsequent paths of training, study, and work of the patients. Furthermore, we had no data available about socioeconomic status of the families of the patients and other familial factors, which might have influenced both the placing of patients in educational tracks and the choice for treatment in our center.

To conclude, this study suggests that a high standard of educational performance is common in adolescents with an ED. Also, our results give indications for an insufficient IQ for the complexity of their educational track, especially in patients who receive education at the higher levels. The largest difference between the measured IQ and the norms for their track was seen in patients who receive education in the second most complex track. Self-oriented perfectionism (inner strivings for perfection) contributed to educational achievement, independent from the IQ. Future research with the consideration of both personal characteristics of ED patients, familial, and other factors is needed to increase the understanding of relationships between EDs and educational performance. For clinical practice, our results suggest that treatment for EDs should include awareness for too high target levels at school and the role of perfectionism in this, which might induce stress and might interfere with treatment and recovery. Assessment of intelligence and perfectionism can be helpful in this. Furthermore, attention for perfectionism incorporated in the treatment might be helpful to facilitate recovery and to enhance quality of life.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Christina M. T. Schilder https://orcid.org/0000-0003-1599-512X
Lot C. Sternheim https://orcid.org/0000-0001-8916-9977
Unna N. Danner https://orcid.org/0000-0001-7038-5717

REFERENCES

Bould, H., De Stavola, B., Magnusson, C., Micali, N., Dal, H., Evans, J., … Lewis, G. (2016). The influence of school on whether girls develop eating disorders. *International Journal of Epidemiology*, *45*(2), 480–488. https://doi.org/10.1093/ije/dyw037

CEDEFOB. (2020). *European center for the development of vocational training*. Retrieved from https://www.cedefop.europa.eu/en/events-and-projects/projects/european-qualifications-framework-eqf

Centraal Bureau voor de Statistiek, Dienst Uitvoering, O., & Ministerie van onderwijs, C. E. W. (2019). *Onderwijs in Cijfers - Leerlingen in het derde jaar voortgezet onderwijs*. Retrieved from https://www.onderwijsincijfers.nl/kengetallen/vo/leerlingen-vo/aantallen-leerlingen-3e-jaar-vo

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillside, NJ: Lawrence Erlbaum Associates.

Damian, L. E., Stoeber, J., Negru-Subtirica, O., & Baban, A. (2017). On the development of perfectionism: The longitudinal role of academic achievement and academic efficacy. *Journal of Personality*, *85*(4), 565–577. https://doi.org/10.1111/jopy.12261

Deary, I. J., Strand, S., Smith, P., & Fernandes, C. (2007). Intelligence and educational achievement. *Intelligence*, *35*(1), 13–21. https://doi.org/10.1016/j.intell.2006.02.001

Dura, J. R., & Bornstein, R. A. (1989). Differences between IQ and school achievement in anorexia nervosa. *Journal of Clinical Psychology*, *45*(3), 433–435.

Dykstra, E. E. (2007). *Relationship of perfectionism and gender to academic performance and social functioning in adolescents* (Dissertation/thesis). Indiana University, Indiana.

Dutch Qualification Framework (NLQF). (2018). NLQF_Brochure_Engels_2018_site.pdf. Retrieved from https://www.nlqf.nl/images/downloads/Artikelen/NLQF_Brochure_Engels_2018_site.pdf

Evers, A., Van Vliet-Mulder, J. C., & Groot, C. J. (2000). *Documentatie van tests en testresearch in Nederland (Suppl. 2005/03)*. Assen, Netherlands: Van Gorcum & Comp.

Fairburn, C. G., & Cooper, Z. (1993). The Eating Disorder Examination (twelfth edition). In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment and treatment* (pp. 317–361). New York, NY: Guildfort Press.

Fassino, S., Abbate-Daga, G., Amianto, F., Leombruni, P., Boggio, S., & Rovera, G. G. (2002). Temperament and character profile of eating disorders: A controlled study with the Temperament and Character Inventory. *International Journal of Eating Disorders*, *32*(4), 412–425. https://doi.org/10.1002/eat.10099

Godart, N. T., Perdereau, F., Curt, F., Lang, F., Venisse, J. L., Halfon, O., … Flament, M. F. (2004). Predictive factors of social disability in anorexic and bulimic patients. *Eating and Weight Disorders*, *9*(4), 249–257.

Goodman, A., Heshmati, A., & Koupil, I. (2014). Family history of education predicts eating disorders across multiple generations among 2 million Swedish males and females. *PLoS One*, *9*(8), e106475. https://doi.org/10.1371/journal.pone.0106475

Halmi, K. A. (2004). Obsessive-compulsive personality disorder and eating disorders. *Eating Disorders*, *13*(1), 85–92. https://org/10.1080/10640260590893683

Harper, K. L., Eddington, K. M., & Silvia, P. J. (2016). Perfectionism and effort-related cardiac activity: Do perfectionists try harder? *PLoS One*, *11*(8), e0160340. https://doi.org/10.1371/journal.pone.0160340

Haynos, A. F., Utzinger, L. M., Lavender, J. M., Crosby, R. D., Cao, L., Peterson, C. B., … Goldschmidt, A. B. (2018). Subtypes of adaptive and maladaptive perfectionism in anorexia nervosa: Associations with eating disorder and affective symptoms. *Journal of Psychopathology and Behavioral Assessment*, *40*(4), 691–700. https://doi.org/10.1007/s10862-018-9672-8

van den Berg, M., Heijink, R., Zwakhals, L., Verkleij, H., & Westert, G. (2010). Health care performance in the Netherlands: Easy access, varying quality, rising costs. *Eurohealth*, *16*, 27.

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology*, *60*(3), 456–470.

Lampard, A. M., Byrne, S. M., McLean, N., & Fursland, A. (2012). The Eating Disorder Inventory-2 perfectionism scale: Factor structure and associations with dietary restraint and weight and shape concern in eating disorders. *Eating Behaviors*, *13*(1), 49–53. https://doi.org/10.1016/j.eatbeh.2011.09.007

Lopez, C., Stahl, D., & Tchanturia, K. (2010). Estimated intelligence quotient in anorexia nervosa: A systematic review and meta-analysis of the literature. *Annals of General Psychiatry*, *9*, 40–40. https://doi.org/10.1186/1744-859X-9-40

Maxwell, M., Thornton, L. M., Root, T. L., Pinheiro, A. P., Strober, M., Brandt, H., … Bulik, C. M. (2011). Life beyond the eating disorder: Education, relationships, and reproduction. *The International Journal of Eating Disorders*, *44*(3), 225–232. https://doi.org/10.1002/eat.20804

Mustelin, L., Raevuori, A., Bulik, C. M., Rissanen, A., Hoek, H. W., Kaprio, J., & Keski-Rahkonen, A. (2015). Long-term outcome in anorexia nervosa in the community. *The International Journal of Eating Disorders*, *48*(7), 851–859. https://doi.org/10.1002/eat.22415

Norris, S. C., Gleaves, D. H., & Hutchinson, A. D. (2019). Anorexia nervosa and perfectionism: A meta-analysis. *The International Journal of Eating Disorders*, *52*(3), 219–229. https://doi.org/10.1002/eat.23009

Nuffic the Dutch organisation for internationalisation in education. (n.d.). Nuffic.Nl. Retrieved from https://www.nuffic.nl/en/education-systems/netherlands

Roth, B., Becker, N., Romeyke, S., Schäfer, S., Domnick, F., & Spinath, F. M. (2015). Intelligence and school grades: A meta-analysis. *Intelligence*, *53*, 118–137.

Schilder, C. M. T., van Elburg, A. A., Snellen, W. M., Sternheim, L. C., Hoek, H. W., & Danner, U. N. (2017). Intellectual functioning of adolescent and adult patients with eating disorders. *The International Journal of Eating Disorders*, *50*(5), 481–489. https://doi.org/10.1002/eat.22594

Sherry, S. B., Hewitt, P. L., Besser, A., McGee, B. J., & Flett, G. L. (2004). Self-oriented and socially prescribed perfectionism in the Eating Disorder Inventory Perfectionism subscale. *The International Journal of Eating Disorders*, *35*(1), 69–79. https://doi.org/10.1002/eat.10237

Stoeber, J. (2012). Perfectionism and performance. In S. M. Murphy (Ed.), *The Oxford handbook of sport and performance psychology* (pp. 294–306). New York: Oxford University Press.

Stoeber, J., Haskew, A. E., & Scott, C. (2015). Perfectionism and exam performance: The mediating effect of task-approach goals. *Personality and Individual Differences*, *74*, 171–176. https://doi.org/10.1016/j.paid.2014.10.016

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review*, *10*(4), 295–319. https://doi.org/10.1207/s15327957pspr1004_2

Stoltz, K., & Ashby, J. S. (2007). Perfectionism and lifestyle: Personality differences among adaptive perfectionists, maladaptive perfectionists, and nonperfectionists. *Journal of Individual Psychology*, *63*(4), 414–423.

Sundquist, J., Ohlsson, H., Winkleby, M. A., Sundquist, K., & Crump, C. (2016). School achievement and risk of eating disorders in a Swedish national cohort. *Journal of the American Academy of Child and Adolescent Psychiatry*, *55*(1), 41–46. https://doi.org/10.1016/j.jaac.2015.09.021

Toedeling nederlandse onderwijsprogrammas (ISCED). (n.d.). Onderwijs in Cijfers. Retrieved from https://www.onderwijsincijfers.nl/kengetallen/internationaal/toedeling-nederlandse-onderwijsprogrammas-isced. Accessed February 2, 2021.

Toro, J., Nicolau, R., Cervera, M., Castro, J., Blecua, M. J., Zaragoza, M., & Toro, A. (1995). A clinical and phenomenological study of 185 Spanish adolescents with anorexia nervosa. *European Child & Adolescent Psychiatry*, *4*(3), 165–174.

van Strien, T. (2002). *Eating Disorder Inventory-II*. Lisse, Netherlands: Swets & Zeitlinger.

Wechsler, D. (2002). *Wechsler Intelligence Scale for Children, third version (WISC-III) Dutch manual*. London, England: The Psychological Corporation.

How to cite this article: Schilder CMT, Sternheim LC, Aarts E, van Elburg AA, Danner UN. Relationships between educational achievement, intelligence, and perfectionism in adolescents with eating disorders. *Int J Eat Disord*. 2021;54:794–801. https://doi.org/10.1002/eat.23482