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KÄROL SOIDLA

Latent profiles and developmental trajectories of eating disorder symptoms

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Latent profiles and developmental trajectories of eating disorder symptoms

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The author of the current dissertation contributed to the listed publications as follows:

- **Study I**: Participated in organizing a part of the study and collecting the data, carried out data analyses, wrote the manuscript as the first author.
- **Study II:** Participated in formulating the research question and took part in organizing and collecting the data, wrote parts of the manuscript as a coauthor.
- **Study III:** Participated in organizing a part of the study and collecting the data, carried out data analyses, wrote the manuscript as the first author.
- **Study IV:** Participated in organizing a part of the study and collecting the data, carried out a part of data analyses, interpreted the results and wrote the manuscript as the first author in collaboration with coauthors.

ABBREVIATIONS

AN	anorexia nervosa
APA	American Psychiatric Organization
ARFID	avoidant-restrictive food intake disorder
BED	binge eating disorder
BMI	body mass index
BN	bulimia nervosa
DE	disordered eating
DFI	dysfunctional impulsivity
DSM	Diagnostic and Statistical Manual of Mental Disorders
ED	eating disorder
FI	functional impulsivity
GMM	growth mixture modeling
ICD	International Classification of Diseases
LPA	latent profile analysis
OSFED	other specified feeding or eating disorders
UFED	unspecified feeding or eating disorders
WHO	World Health Organization

1. INTRODUCTION

Eating disorders (ED) are psychiatric disorders, which often result in serious impairment of psychosocial functioning and one's physical health, possibly leading to mortality. They are characterized by a range of abnormal eating behaviours (e.g., restricted eating, purging behaviours, compensatory behaviours to increase energy expenditure, binge eating), mostly led by the wish to control one`s body weight and shape. Preoccupation with weight and body shape as well as their overevaluation and body concerns are the core cognitive features of EDs. (Treasure et al., 2020) EDs can severely impact both physical health and psychosocial functioning, leading to persistent, life-threatening somatic symptoms and high psychological distress, as well as significant healthcare and societal costs (Agras, 2001; Kärkkäinen et al., 2018; Keski-Rahkonen & Mustelin, 2016; Qian et al., 2022).

1.1. Current categorical classification of eating disorders

Current diagnostic manuals of psychiatric disorders – the International Classification of Diseases 11th Revision (ICD-11; *World Health Organization (WHO),* 2024) and the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR; *American Psychiatric Association (APA), 2022*) both encompass three major EDs, but additionally three feeding disorders. *Anorexia nervosa* (AN), *bulimia nervosa* (BN), and binge eating disorder (BED) are the three EDs, while avoidant-restrictive food intake disorder (ARFID), pica and rumination-regurgitation disorder, which were previously categorized as childhood disorders, make up the feeding disorders trio. In addition, both diagnostic manuals offer the possibility to code the disorder as other specified feeding or eating disorders (OSFED) for disorders not reaching the full criteria of an ED or unspecified feeding or eating disorders (UFED), mainly for individuals not fitting any other category or for whom there is not enough information about to make a specific diagnostic decision.

Anorexia nervosa is characterized by significantly low body weight, more particularly body mass index (BMI) below 18.5 kg/m² in adults (or for children and adolescents BMI-for-age under 5th percentile) or rapid weight loss or failure to gain weight considering one's expected developmental trajectory. However, DSM-5-TR does not specify a strict cut-off, instead emphasizing a clinically significant deviation from expected weight in the context of age, sex, developmental trajectory, and health status, which reflects the ongoing lack of consensus regarding precise thresholds (APA, 2022). Individuals with AN show extreme restrictive eating behaviour, and may also show excessive physical activity, and/or purging behaviour (e.g. self-induced vomiting). The behaviours are led by extreme fear of weight gain and overevaluation of body weight and shape. *Bulimia nervosa* encompasses frequent recurrent episodes of binge eating followed by compensatory behaviours (e.g., self-induced vomiting, misuse of drugs

targeting or influencing weight loss, strenuous exercise). Binge eating is defined as a limited period of time where the individual experiences loss of control over food intake leading to consuming notably more food than usual and finds this to be highly distressing. Similarly to AN, individuals with BN also show preoccupation with their body weight and shape. BED is characterized by highly distressing and frequent episodes of binge eating. Binge eating episodes often bring up intense feelings of guilt, shame, and disgust. In contrast to individuals with BN, compensatory behaviours do not frequently follow binge eating episodes. (WHO, 2024)

While individuals with AN, BN, and BED often show preoccupation with body weight and shape, feeding disorders represent a distinct group. These disorders are defined by disturbances in feeding behaviour that are not motivated by weight or shape concerns, but that nonetheless lead to clinically significant consequences such as nutritional deficiencies, weight loss or growth impairment, dependence on nutritional supplements, or marked interference with psychosocial functioning. These disturbances may manifest as persistent avoidance of certain foods, lack of interest in eating, repeated regurgitation, or the consumption of non-food substances. (APA, 2022; WHO, 2024)

Among feeding disorders, avoidant-restrictive food intake disorder (ARFID) may superficially resemble EDs, particularly in cases of low weight or nutritional compromise, which can lead to diagnostic confusion. However, ARFID is diagnostically distinct because body image disturbance is absent. It is defined by avoidance or restriction of food intake that results in significant weight loss (or failure to gain expected weight), nutritional deficiencies, or dependence on supplemental feeding. Significant functional impairment (e.g., in social or educational domains) typically accompanies ARFID, and restriction may involve both the amount and variety of food (WHO, 2024). DSM-5-TR also describes three main ARFID profiles: (1) ARFID with sensory sensitivity (e.g., toward taste, texture, smell), (2) ARFID related to fear of aversive consequences (e.g., vomiting, choking), and (3) ARFID characterized by a lack of interest in food or eating (APA, 2022).

1.2. The prevalence and gender differences in disordered eating

The prevalence of EDs may still be underestimated, but average lifetime prevalence in Western cultures has been estimated to be about 1.89%, and is higher in women overall reaching about 2.6% in females (Qian et al., 2022). Other studies have found the percentages to be higher – 8.4% for woman and 2.2% for man (Galmiche et al., 2019). Meta-analytic findings estimate the prevalence of disordered eating (DE – wide array of ED related behaviours that do not reach clinical threshold) to be around 22%, with significantly higher rates among girls compared to boys (López-Gil et al., 2023). For example, among adolescents aged 10 to 18 years, 30.9% of girls and 14.6% of boys were identified as at risk for

EDs (Zeiler et al., 2016), a pattern consistent with earlier studies reporting DE in approximately 24% of girls and 16% of boys (Hautala et al., 2008). In other studies even higher percentages have been reported – e.g., 50% of girls and 30% of boys showing DE in adolescence (Yoon et al., 2020). In clinical settings, however, the gender gap appears even more pronounced: outpatient data show a female-to-male ratio of approximately 5:1 (83.5% women vs. 16.5% men), with AN and BN predominating among females, whereas BED is the most frequently diagnosed ED among male patients (Valente et al., 2017).

Gender differences also emerge in symptom presentation, with excessive exercise and fasting more prevalent among male patients, whereas self-induced vomiting and laxative or diuretic use are more frequently reported by female patients (Valente et al., 2017). However, emerging evidence highlights the potential underdiagnosis and undertreatment of EDs in males, partly because existing diagnostic frameworks and screening tools are are primarily based on symptom presentations more common in women (e.g., drive for thinness rather than muscularity concerns). As a result, the true prevalence of EDs among men may be substantially underestimated (Gorrell & Murray, 2019; Murray et al., 2017). Moreover, risk factors of DE may also operate differently across genders. For instance, body dissatisfaction strongly predicts weight and shape concerns in girls, while among boys, its predictive effect may depend on interaction with higher BMI (Micali et al., 2015). Additionally, it has been argued that gender-specific body ideals (thinness versus muscularity) warrant separate investigation of risk mechanisms (Gorrell & Murray, 2019).

1.3. The development of disordered eating

Although there is no clear consensus about the average age of onset of EDs, adolescence and young adulthood (approximately ages 12 to 25) represent the highest-risk period, with incidence rates peaking in mid-adolescence and early adulthood (Favaro et al., 2019; Schmidt et al., 2016; Volpe et al., 2016). Adolescence is a critical developmental period marked by profound biological, psychological, and social transitions. These physiological and hormonal changes, combined with increasing psychosocial pressures to conform to culturally idealized body types, are thought to contribute to increased vulnerability to EDs during this period (Keel & Forney, 2013; Klump, 2013). Research mostly suggests that the peak incidence of EDs occurs between the ages of 14-15 years (López-Gil et al., 2023; Micali et al., 2013). However, symptoms can begin earlier, and cases of early-onset EDs, defined as onset before age 13, have been increasingly recognized (Nicholls et al., 2011). The timing of onset also appears to differ by ED subtype: disorders characterized by restrictive behaviours, such as AN, tend to emerge earlier, whereas conditions involving binge eating or purging behaviours typically develop later in adolescence (Nagl et al., 2016; Volpe et al., 2016).

Despite general findings, recent developmental research increasingly highlights that DE symptoms may begin much earlier and follow heterogeneous

trajectories across childhood and adolescence. Longitudinal studies using growth mixture modelling (GMM) have shown that individuals do not follow a uniform course, but instead display distinct patterns of symptom emergence, stability, and escalation across development. Several studies have consistently identified at least three broad developmental trajectories for DE. Typically, these include a low-stable trajectory, where DE symptoms remain minimal over time; an increasing trajectory, where symptoms escalate during adolescence; and a high-decreasing trajectory, where initially elevated DE symptoms decline over time (Fairweather-Schmidt & Wade, 2016). Although these patterns are the most consistently replicated, additional trajectories have also been reported. Some studies have distinguished subgroups with stable-moderate and moderate-increasing symptom levels (Aimé et al., 2008), as well as moderate-decreasing trajectories (Rodgers et al., 2016; Wang et al., 2019) and high-stable trajectories (Pereira et al., 2024), highlighting even greater heterogeneity in DE development. Conversely, other studies have found only a basic distinction between high- and low-symptom groups (Breton et al., 2022).

Importantly, different features of DE may follow distinct developmental courses, making the overall picture even more nuanced. For instance, in addition to the typical low, increasing, and high-decreasing patterns found for binge eating and food preoccupation, researchers have identified delayed increase and delayed decrease trajectories in dieting behaviours (Bodell et al., 2018). Developmental patterns identified based on specific facets of DE may also depend on the age at baseline assessment included in the studies. For example, studies focusing on the timing of symptom onset indicate that body dissatisfaction often appears first, sometimes as early as ages 9-11 (Bodell et al., 2018). Similarly, Lacroix et al. (2023) found largely stable body esteem trajectories between ages 11 and 15, with elevated DE symptoms evident from as early as age 11 and Breton et al. (2022) identified that the most prominent rise in DE symptoms occurred between ages 12 and 15, while BN-related symptoms have been found to peak slightly later (Verschueren et al., 2020).

Sample composition based on gender and other factors included in trajectory analysis may also play a role. Although girls are typically more likely to follow high-risk trajectories, the slopes of DE symptom trajectories may not significantly differ by gender (Breton et al., 2022; Verschueren et al., 2020). However, when BMI was incorporated into the analysis, more differentiated pathways were observed among girls: (1) normal BMI with low DE, (2) low BMI with low DE, (3) normal BMI with high DE, and (4) high BMI with high DE. Among boys, trajectories were less differentiated, with most following normal BMI with low DE and a smaller group showing high BMI with DE (Verschueren et al., 2020).

Heterogeneity in trajectories carries important clinical implications. Adolescents who follow increasing or high-stable trajectories are at greater risk of developing full-syndrome EDs, as ED symptoms tend to persist or escalate over time (Herle et al., 2020; McClelland et al., 2020; Stice et al., 2017). Understanding when and among whom DE develops offers meaningful insights for early prevention and targeted intervention.

1.3.1. Developmental risk factors of eating disorders

Several biological, psychological, and sociocultural factors contribute to the development of EDs and DE during adolescence, with many risk factors appearing relatively consistent across ED diagnoses (Barakat et al., 2023; Culbert et al., 2015; Hilbert et al., 2014). Biological vulnerabilities include genetic predispositions, alterations in gastrointestinal microbiota, and even autoimmune processes (Bulik et al., 2019; Fan et al., 2023; Hedman et al., 2019; Terry et al., 2022). Psychological risk factors such as perfectionism, negative urgency, elevated negative affectivity, emotion regulation difficulties, and low self-esteem have been consistently moderately to strongly associated with DE (Colmsee et al., 2021; Culbert et al., 2015; Farstad et al., 2016; Prefit et al., 2019). From a sociocultural perspective, perceived pressure for thinness from media and peers, internalization of societal body ideals, and resulting body dissatisfaction further amplify the risk (Izydorczyk & Sitnik-Warchulska, 2018; Rohde et al., 2015; Weissman, 2019). There is mixed evidence regarding weight status as a risk factor: while some studies find that being overweight, particularly when combined with depressive symptoms, increases the risk for DE (Goldschmidt et al., 2015; Stice et al., 2011), others report no direct association between BMI and DE (Rohde et al., 2015). Specific behaviours such as early dieting attempts or, conversely, family patterns of overeating have also been implicated as precursors of later ED pathology (Hilbert et al., 2014; Stice et al., 2011). Comorbid psychiatric conditions such as depression, anxiety, and personality disorders have been shown to increase the severity and chronicity of ED symptoms (Hambleton et al., 2022a; Momen et al., 2022). Family dynamics, including poor communication, parental criticism, or a family history of EDs, can also play a crucial role (Del Casale et al., 2023; Van Malderen et al., 2023). In addition, adverse life events, including trauma have been strongly associated with EDs (Brewerton, 2022; Guillaume et al., 2016).

1.4. Beyond categories: limitations of current eating disorder classifications

Although the current categorical classifications of EDs have developed in recent years and are now accompanied by the option to use specifiers (e.g., binge-eating/purging or restrictive type for AN, severity assessment based on BMI (for AN), frequency of compensatory behaviours (BN), and frequency of binge eating episodes (BED)) (APA, 2022; WHO, 2024), substantial limitations remain.

A large proportion of individuals with clinically significant symptoms still do not fit into any diagnostic category, either because they do not meet full criteria, display overlapping symptoms from multiple EDs, or shift between diagnoses over time (Ackard et al., 2011; Schaumberg et al., 2019; Solmi et al., 2024). This results in frequent OSFED diagnoses, which may contribute to

diagnostic ambiguity and create confusion among clinicians and patients alike (Solmi et al., 2024).

Moreover, DE is also highly prevalent in general population and the boundary between clinical EDs and subclinical ED is often unclear (Hay et al., 2023; Peschel et al., 2024). DE encompasses a wide array of behaviours from dieting, excessive exercise, infrequent purging behaviour to different distress levels due to body weight and shape concerns (Pereira & Alvarenga, 2007; Tanofsky-Kraff & Yanovski, 2004). There is growing recognition that eating behaviours exist on a continuum, ranging from normative eating to disordered patterns and clinically significant ED symptoms, rather than as discrete categories.

As stated, ED diagnoses are characterized by considerable heterogeneity meaning individuals with the same diagnosis can differ substantially in symptom presentation, comorbid conditions, and personality traits (e.g., Colizzi et al., 2024; Keski-Rahkonen & Mustelin, 2016; Riesco et al., 2018). For example, an individual diagnosed with AN binge-eating/purging subtype may resemble someone with BN more closely than another individual with AN restricting subtype. This diagnostic heterogeneity complicates research and clinical decision-making (especially in the already critical landscape of ED interventions) and may ultimately hinder treatment outcomes (Kazdin et al., 2017; Monteleone et al., 2022). For instance, there are no meta-analyses for treatment response among individuals with OSFED, despite its clinical significance and comparable chronicity and remission rates to AN and BN (Monteleone et al., 2022). Overreliance on traditional diagnostic boundaries may therefore limit the identification of shared, transdiagnostic mechanisms underlying EDs and may bias both research findings and clinical care by systematically excluding large subsets of affected individuals.

1.4.1. Alternative approaches to eating disorder classification

Given the previously discussed limitations of categorical classification systems in EDs, there has been growing interest in alternative approaches that move beyond rigid diagnostic categories focused solely on ED-specific behavioural symptoms. Categorical systems often provide limited insight into the mechanisms that maintain EDs and can constrain treatment development and research (Insel et al., 2010; Wildes & Marcus, 2013a). These concerns span across psychological, nosological, and genetic research domains, where meaningful diagnostic categories are essential for accurately studying disorders and drawing valid conclusions (Bulik et al., 2021; Livney et al., 2025).

Wildes & Marcus (2013a) highlight two primary models in ED classification research: one that classifies individuals based on specific ED symptoms, and another that emphasizes comorbid psychopathology or associated features, such as personality traits. The latter approach may provide a more integrative and individualized understanding of EDs by capturing the dynamic interplay between symptoms and underlying personality characteristics. Indeed, personality traits have been consistently linked to the development, expression, and maintenance

of EDs (Cassin & von Ranson, 2005; Dufresne et al., 2020; Farstad et al., 2016), suggesting that their inclusion in classification models could improve predictions of treatment outcomes and clarify both shared and distinguishing features across subtypes (Wildes & Marcus, 2013a). Moreover, personality-informed classifications may help bridge the gap between dimensional and categorical perspectives by offering clinically meaningful subgroups that reflect both symptom severity and etiological diversity.

1.5. Personality and personality-based subtypes in eating disorders

Research on personality traits has consistently demonstrated significant associations with EDs and DE. Neuroticism, a transdiagnostic risk factor for nearly all forms of psychopathology, characterized by emotional instability and a heightened tendency toward negative affect, has been strongly linked to EDs across diagnostic categories (Dufresne et al., 2020; Farstad et al., 2016). Conscientiousness has shown mixed associations: stronger associations are typically observed in individuals with AN restricting type compared to those with BN, BED, or OSFED (Dufresne et al., 2020; Farstad et al., 2016). Paradoxically, lower levels of conscientiousness have also been associated with greater body dissatisfaction, regardless of actual body weight (Allen & Robson, 2020). Findings related to openness to experience, and agreeableness have generally shown weaker, null, or inconsistent associations with EDs. Results regarding extraversion have also been mixed, though some studies suggest that lower levels of extraversion may predict higher level of DE (for an overview, see Gilmartin et al., 2022).

The observed inconsistencies in the literature may be partly explained by additional ED-associated behaviours, comorbid traits, or symptom severity, which can moderate or mediate associations between personality and ED behaviours (Legg & Turner, 2021). This suggests that personality traits do not map neatly onto ED diagnostic categories, but their influence depends on such interacting factors. It is also important to consider the level of analysis at which personality is assessed: broad domains may obscure associations that become clearer when examining narrower facets or nuances. Taken together, these points underscore the need to move beyond a one-size-fits-all view and to conceptualize personality dimensions along continuum such as inhibition-disinhibition or effortful control, which may provide a more nuanced framework for classifying DE based on personality (Wildes & Marcus, 2013a).

In line with this, a consistent pattern has emerged across studies that classify or profile individuals based on personality traits. Three main subtypes are frequently identified: undercontrolled, overcontrolled, and resilient (high functioning). The undercontrolled subtype is typically characterized by elevated impulsivity, poor emotion regulation, and a tendency toward disinhibited behaviours. In contrast, the overcontrolled subtype is marked by excessive inhibition, heightened perfectionism, and cognitive and behavioural rigidity. The

resilient (or high functioning) subtype, by comparison, is distinguished by adaptive self-regulation, lower levels of psychopathology, and greater use of flexible coping strategies. These subtypes have been observed in both clinical and community samples, across different personality measures and classification techniques (Gilmartin et al., 2024; Isaksson et al., 2021; Schaefer et al., 2024; So et al., 2024; Thompson-Brenner & Westen, 2005; Turner et al., 2014; Wildes et al., 2011; Wildes & Marcus, 2013a). In addition to these three main subtypes, several studies have identified additional profiles that may further refine our understanding of heterogeneity in EDs (e.g., Krug et al., 2011; Thompson-Brenner et al., 2008).

Personality-based subtypes often reflect broader dimensions of control, ranging from overcontrol to undercontrol, or from inhibition to disinhibition – dimensions thought to underlie both the development and maintenance of EDs. Among the traits most consistently associated with these dimensions, and with EDs more broadly, are perfectionism and impulsivity. These traits not only map conceptually onto the over- and undercontrolled subtypes but also represent well-established risk and maintenance factors across ED diagnoses. Investigating their interplay may thus offer a more refined understanding of individual differences in ED expression and contribute to more targeted prevention and intervention strategies.

1.5.1. Perfectionism and eating disorders

Perfectionism has been defined as "the tendency to demand of others or oneself an extremely high or even flawless level of performance, in excess of what is required by the situation" (APA Dictionary of Psychology, 2018). It is widely recognized as a multidimensional personality construct. One of the most commonly used frameworks is provided by Frost et al. (1990), who identified key dimensions of perfectionism: personal standards, concern over mistakes, doubts about actions, parental expectations, and parental criticism – the latter two reflecting perceived external standards and evaluation. These dimensions are frequently grouped into two higher-order domains: perfectionistic strivings, which involve setting and pursuing high personal standards, and perfectionistic concerns, which reflect worries about making mistakes, fear of negative evaluation, and self-criticism.

Building on this distinction, researchers have emphasized that perfectionism encompasses both maladaptive and adaptive components, with the former linked to psychological distress and the latter associated with motivation and achievement (Stoeber & Otto, 2006). Relatedly, the concept has been also described as clinical perfectionism, referring to the persistent pursuit of high personal standards despite negative consequences (Shafran et al., 2002). Perfectionism, particularly its maladaptive dimensions, has been consistently linked to overcontrol, inhibition, and even compulsivity in broader psychological research (Dimaggio et al., 2018; Lunn et al., 2023; Pinto et al., 2017). Perfectionism has been included into theoretical frameworks regarding EDs – most notably, the

transdiagnostic model of EDs, which highlights that dysfunctional perfectionism contributes to rigid rules and ideals surrounding body shape and weight. According to this model, individuals often base their self-worth on achieving these standards and maintaining perceived control (Fairburn et al., 2003; Riley et al., 2007). Indeed, perfectionism has been associated with several forms of psychopathology, including EDs, and is considered a possible transdiagnostic risk factor and a maintaining mechanism (Egan et al., 2011).

There has been extensive research examining the associations between perfectionism and EDs (Stackpole et al., 2023) as well as perfectionism and broader psychopathology (Limburg et al., 2017). In individuals with AN, higher levels of maladaptive perfectionism have been observed compared to healthy controls, although no significant differences have consistently emerged when comparing AN and BN populations (Dahlenburg et al., 2019). Perfectionistic concerns, such as fear of making mistakes and overly critical self-evaluations, have been linked to the development of BN-related symptoms (Kehayes et al., 2019). Regarding binge eating, associations have been found between perfectionism and binge eating, with stronger links observed for perfectionistic concerns than for perfectionistic strivings (Vicent et al., 2023). Perfectionism (both perfectionistic strivings and concerns) has been consistently linked to DE also in children and adolescents, suggesting that it may serve as an early-emerging risk factor (Bills et al., 2023; Johnston et al., 2018; Livet et al., 2023). Similar to findings in adult populations, no substantial differences have been observed in how perfectionism relates to binge-purge versus dietary-restraint ED subtypes in youth (Curzio et al., 2018) and perfectionistic concerns appear to be a more robust and consistent predictor of DE than perfectionistic strivings (Vacca et al., 2021). Taken together, these findings highlight the importance of perfectionism, especially its maladaptive aspects, across developmental stages and the full spectrum of DE behaviours.

Discussion about whether perfectionistic strivings can sometimes reflect a more adaptive form of perfectionism continue. Some researchers have suggested that adaptive perfectionism may relate differently to EDs depending on the specific diagnosis (Kehayes et al., 2019). However, a broader meta-analysis found that EDs were the only diagnostic category that showed strong associations with both dimensions of perfectionism – perfectionistic strivings and concerns (Limburg et al., 2017). Keeping in mind the limitations of categorical diagnoses, Stackpole et al. (2023) conducted a meta-analysis connecting ED diagnoses into a single group. Their results again supported that both perfectionistic strivings (small, pooled association) and concerns (moderate association) are linked to ED symptoms.

1.5.2. Impulsivity and eating disorders

Impulsivity is a multifaceted construct, generally defined as the tendency to act quickly without adequate thought or insufficient consideration of the consequences (Barratt, 1983; Daruna & Barnes, 1993). Impulsivity encompasses

several dimensions, although the specific dimensions may vary depending on the scale used. For example, common dimensions include lack of premeditation, lack of perseverance, sensation seeking, and urgency, the latter referring to impulsive actions driven by emotional states (Whiteside & Lynam, 2001). Other models instead distinguish attentional, motor, and non-planning impulsiveness (Patton et al., 1995). Neurobiological distinctions have also been proposed; for example, reward expectation and delay discounting are associated with different neuroanatomical and neurochemical systems than response inhibition and cognitive dysregulation (Dalley & Robbins, 2017). Impulsivity can be conceptualized as both a state and trait construct, although correlations between behavioural measures of impulsivity and self-reported trait impulsivity measures have yielded mixed results (Baker et al., 2024; Huang et al., 2024; Wingrove & Bond, 1997).

Psychology literature has further categorized impulsivity into dysfunctional and functional domains (Dickman, 1990). Dysfunctional impulsivity (DFI) refers to a tendency to act hastily and without reflection, often leading to negative outcomes such as risky or harmful behaviours. In contrast, functional impulsivity (FI) reflects the ability to make quick decisions and take rapid action in situations where speed is advantageous. Recognizing the potentially adaptive aspects of impulsivity offers a more nuanced and dimensional perspective of the trait, especially as studies have found differential associations between FI and DFI and various psychological outcomes. DFI has been commonly linked to a wide range of psychopathologies, including mood disorders, substance use disorders, personality disorders, and EDs (Crisp & Grant, 2024). While impulsivity has traditionally been associated with externalizing problems, it has also been linked to internalizing psychopathology, particularly through the constructs of negative and positive urgency, which reflect emotion-driven impulsivity (Cosi et al., 2011; Willie et al., 2022). Research on the role of FI in psychopathology is more limited. However, existing studies suggest that FI is associated with higher levels of extraversion and lower levels of neuroticism (Smillie & Jackson, 2006), more efficient and accurate information processing (Brunas-Wagstaff et al., 1994). In contrast, lower levels of FI may predict the development of generalized anxiety disorder (Pawluk & Koerner, 2013).

Impulsivity has long been linked to EDs, particularly those characterized by binge eating and purging behaviours, but it has been argued that focusing solely on these behaviours risks oversimplifying the complex associations between impulsivity and EDs (Lavender & Mitchell, 2015; Waxman, 2009). Individuals with BN and BED frequently report elevated impulsive tendencies, and impulsivity has been associated with both the occurrence of binge episodes (Fischer et al., 2008) and with the severity of BED, as patients scoring high on impulsivity often present with more severe eating pathology, elevated depressive symptoms, and greater psychiatric comorbidity compared to those with lower impulsivity (Boswell & Grilo, 2021). Similar patterns have been observed in individuals with the binge-purge subtype of AN, who show impulsivity particularly in relation to purging behaviours (Hoffman et al., 2012).

At the same time, impulsive traits are not limited to disorders involving bingeing or purging. Even individuals with the restrictive subtype of AN have demonstrated tendencies such as emotional instability and poor decision-making, particularly under distress (Mallorquí-Bagué et al., 2020). Thus, although impulsivity is most consistently associated with binge-type presentations, it is not exclusive to them. Indeed, across all ED subtypes, elevated rates of comorbid impulse-control disorders and behavioural addictions have been reported (Devoe et al., 2022).

Although much of the literature has focused on adults, similar associations are emerging in adolescents, though findings have been more mixed. As in adults, impulsivity has been linked to the development of binge eating (Pearson, Zapolski, et al., 2015), but in some studies, it has failed to predict DE (Wonderlich et al., 2004). More recent research has shifted toward examining impulsivity in interaction with other traits. For example, adolescents with high impulsivity and affective reactivity are at increased risk of developing DE attitudes over time (Evans et al., 2019), as are those with a combination of impulsivity and high neuroticism (Lee-Winn et al., 2016). Recent reviews emphasize that impulsivity plays a more complex, nuanced (rather than straightforward) role in EDs than previously thought (Barakat et al., 2023; Varela et al., 2023).

Altogether, these findings highlight that impulsivity contributes to a broader range of DE patterns than previously recognized. A nuanced understanding of its role across ED subtypes and developmental stages may support the development of more tailored prevention and intervention strategies. Adolescence is a critical developmental period marked by heightened impulsivity and emotional reactivity, making it especially important to understand how specific facets of impulsivity contribute to ED risk during this stage.

1.5.3. Coexistence of impulsivity and perfectionism

Perfectionism and impulsivity have traditionally been viewed as opposing constructs along a continuum of self-control – perfectionism reflecting excessive inhibition or overcontrol, and impulsivity reflecting undercontrol or disinhibition. This binary model has influenced much of the clinical and research understanding of EDs (e.g., in descriptions of overcontrolled vs. undercontrolled personality styles) (Gilmartin et al., 2024; Isaksson et al., 2021). However, emerging evidence challenges this view, showing that these traits often co-occur and interact in ways that heighten vulnerability (Boone et al., 2014; Christian et al., 2021; Slof-Op't Landt et al., 2016). This interplay may help explain the heterogeneity observed in ED presentations. For example, individuals with binge-type eating disorders frequently show both high impulsivity (particularly negative urgency, the tendency to act rashly under distress) and high perfectionism, including rigid standards and self-criticism, which in turn may contribute to compensatory behaviours (Davis et al., 2024; Racine et al., 2017; Vicent et al., 2023). Even indi-

viduals with restrictive eating patterns, such as those seen in AN, may simultaneously display impulsive tendencies, particularly in the form of bingeing, purging, or self-harm (Lavender et al., 2017; Lavender & Mitchell, 2015).

The construct of compulsivity can also help to explain their co-occurrence by highlighting rigid, repetitive control that overlaps with maladaptive perfectionism (Lunn et al., 2023; Pinto et al., 2017; Wu & Cortesi, 2009). Importantly, compulsivity and impulsivity are not polar opposites: in broader psychopathology, such as personality and obsessive-compulsive disorders, they frequently co-occur and may reflect distinct expressions of impaired self-regulation (Fineberg et al., 2014; Robbins et al., 2012). A review has also concluded that there is no strong evidence to conceptualize AN as a disorder of compulsivity and BN as a disorder of impulsivity – the findings are mixed and show support for the transdiagnostic view of EDs, challenging traditional assumptions of clear trait-based diagnostic distinctions (Howard et al., 2020).

One mechanism linking perfectionism and impulsivity is shared emotion regulation difficulty: both traits are associated with maladaptive strategies. In perfectionism, rigid attempts to control emotional discomfort (e.g., suppression, rumination, cognitive avoidance) can paradoxically intensify distress. In impulsivity, distress is often managed via rapid, relief-seeking actions (Fisher-Fox et al., 2024; Maier et al., 2021; Schreiber et al., 2012). Their co-occurrence may be especially problematic when perfectionistic concerns heighten negative affect (often via rumination or suppression) which is then discharged through impulsive behaviours (Vois & Damian, 2020), particularly among individuals high in emotion-driven impulsivity (Carver & Johnson, 2018). So paradoxically, extreme perfectionistic control may itself represent a form of underlying emotional dysregulation, ultimately resulting in loss of control and impulsive behaviours. Conversely, heightened impulsivity can destabilize perfectionistic goal pursuit and exacerbate psychological distress, for example, by amplifying self-disgust (Lazuras et al., 2019).

The interplay between these traits has been associated with increased severity of DE and EDs. Boone et al. (2014) found that individuals high in both perfectionism and impulsivity exhibited greater symptom severity than those high in either trait alone. Beyond eating pathology, Christian et al. (2021) reported that co-occurring elevations in perfectionism and impulsivity were linked to higher psychiatric symptom burden across multiple domains. These findings align with models proposing alternating cycles of rigid control and behavioural disinhibition (Fairburn et al., 2003; Pearson et al., 2015). At the same time, results are not uniform: some studies suggest that maladaptive perfectionism can relate to lower impulsivity, whereas facets of adaptive perfectionism show positive associations with impulsivity (Wainwright et al., 2020). Taken together, the evidence indicates that perfectionism and impulsivity are neither simple opposites nor independent; rather, through shared emotion-regulation liabilities and context-dependent expression, their co-occurrence contributes to clinically meaningful heterogeneity in DE and underscores the value of trait-informed assessment, prevention, and intervention.

2. AIMS OF THE DISSERTATION

The aim of this doctoral thesis was to examine how perfectionism, impulsivity, and their interaction contribute to the underlying heterogeneity of disordered eating patterns. A further aim was to investigate developmental trajectories of disordered eating and identify the factors that predict membership in high-risk trajectories. In doing so, the thesis also took into account the limited research on males and the possible influence of developmental stage.

Specifically, the objectives were as follows: (1) to classify individuals into latent profiles based on impulsivity, perfectionism, and eating disorder symptoms in order to identify personality-based subtypes and explore interactions between these traits in both individuals with eating disorders and healthy controls (**Study I, II**), as well as in a population-representative sample of adolescents (**Study III**); (2) to evaluate the methodological robustness of these profiles, with particular attention to two key questions: whether personality measures should be combined with eating disorder symptoms within the same profiling model (**Study II**), and whether individuals with EDs and healthy controls can be meaningfully modelled together (**Study I**); and (3) to investigate developmental trajectories of disordered eating and the psychosocial risk factors predicting trajectory membership (**Study IV**).

Together, these studies aim to clarify the role of personality and comorbid psychopathology in the development and progression of EDs, contributing to the identification of high-risk profiles and supporting more targeted approaches to prevention and intervention.

3. MATERIALS AND METHODS

3.1. Participants

Two main samples were used in the studies of this dissertation. **Studies I** and **II** employed a mixed sample of individuals with EDs and healthy controls, while **Studies III** and **IV** utilized a population-representative sample of adolescents.

3.1.1. Individuals with eating disorders and healthy controls (Studies I, II)

The sample for **Study I** included 274 women, of whom 164 were individuals diagnosed with an ED (M = 22.4, SD = 7.03), and 110 were healthy controls (M = 24.4, SD = 8.19). The ED individuals were diagnosed as follows: *anorexia nervosa* restricting type (AN-R) (32.3% of individuals with EDs), AN binge-eating/purging type (AN-BP) (6.7%), atypical AN restricting type (3.6%), *bulimia nervosa* binge-eating/purging type (BN-BP) (48.1%), and binge-eating disorder (BED) (7.9%). In **Study II**, the healthy controls were excluded, and additional data were collected, which resulted in a sample of 249 women with a primary diagnosis of ED (M = 21.91, SD = 6.78). This sample included 48.2% participants diagnosed with AN, 43.8% with BN, and 6.8% with BED. In **Study II**, the subcategorization of binge-purge and restricting types of disorders was not used. All individuals with EDs were recruited from the inpatient unit of the Eating Disorders Unit at the Psychiatric Clinic of Tartu University Hospital, while healthy controls were recruited via public advertisements and university lists using a chain sampling method. Exclusion criteria for both studies included intellectual disability, acute psychotic episode, and involuntary hospitalization.

3.1.2. Adolescents from a population-representative sample (Studies III, IV)

The samples for **Studies III** and **IV** were drawn from the longitudinal study "Age-related Changes in Eating Behavior and Factors Predicting Disturbed Eating Behavior in Adolescents*"* that included adolescents participating across four assessment waves, with data collected at 12-month intervals for the first three waves and at a 24-month interval between the third and fourth wave. Participants were recruited from 14 randomly selected schools across South Estonia with the sample distribution as follows: at Wave 1 (5th grade), 308 students (175 girls, 133 boys) aged 11–12 years (M = 11.53, SD = 0.53); at Wave 2 (6th grade), 262 students (153 girls, 109 boys) aged 12–13 years (M = 12.56, SD = 0.52); at Wave 3 (7th grade), 249 students (138 girls, 111 boys) aged 13–14 years (M = 13.63, SD = 0.55); and at Wave 4 (9th grade), 162 students (98 girls, 64 boys) aged 15–16 years. For profiling purposes, **Study III** relied on Wave 3 data, when personality traits were first assessed. In **Study IV**, developmental trajectories were analysed based on data from 298 participants who took

part in at least two assessment waves. Demographic data revealed that all participants identified as White/Caucasian; 39% lived in a city, 54% in a town, and 7% in a rural village. Most adolescents (66%) lived with both parents, 29% with single parent, and 5% in other arrangements.

3.2. Measures

3.2.1. Eating Disorders Assessment Scale (Studies I, II)

Eating Disorders Assessment Scale (EDAS) (Akkermann, 2010) is a 29-item self-report questionnaire, which assesses ED symptoms. Items are answered on a 6-point Likert scale (from "never" to "always"). The scale consists of four subscales: Restrained eating, Binge eating, Purging, and Preoccupation with body image and body weight.

3.2.2. Frost's Multidimensional Perfectionism Scale (Studies I–III)

Frost Multidimensional Perfectionism Scale (FMPS) (Frost et al., 1990) is a self-report questionnaire assessing perfectionism. The Estonian version (Pullmann et al., unpublished manuscript) consists of 28 items, which are answered on a 5-point Likert scale (from "strongly disagree" to "strongly agree"). The adapted version resembles the original FMPS consisting of four subscales: Organization, Personal standards, Concern over mistakes/doubts about actions, and Parental criticism/parental expectations. The first two form the negative perfectionism subscale and the latter positive perfectionism subscale.

3.2.3. Dickman's Impulsivity Inventory (Studies I, II)

Dickman's Impulsivity Inventory (DII) (Dickman, 1990; Estonian version Kuppart, 2005) is a 24-item self-report questionnaire, which is answered on a 5-point Likert scale (from "totally agree" to "do not agree at all") measuring trait impulsivity. It consists of two subscales: Functional impulsivity (FI) Dysfunctional impulsivity (DFI).

3.2.4. M.I.N.I. (Studies I, II)

Mini-International Neuropsychiatric Interview MINI 5.0.0. (Sheehan et al., 1998) is a short structured psychiatric interview that was developed to diagnose DSM-IV-R and ICD-10 mental disorders. Clinical interviews were conducted by a trained clinical psychologist and both ED and comorbid diagnoses were confirmed by a treating psychiatrist.

3.2.5. BMI (Studies I, III, IV)

Body Mass Index (BMI) was calculated using the standard formula: body weight (kg) / height (m^2). In **Study I**, weight and height measurements were obtained using standardized procedures in the hospital. In **Studies III** and **IV**, measurements were taken by the school nurse on the day of assessment.

3.2.6. Maladaptive and Adaptive Impulsivity Scale (Study III)

Based on the constructs of functional (quick and appropriate thinking and response style when optimal) and dysfunctional (excessive haste and restlessness) impulsivity (Dickman, 1990), items reflecting these constructs were selected from the short version of the International Personality Item Pool (IPIP; Goldberg et al., 2006; Mõttus et al., 2006). The wording was simplified for children. The items were assessed on a 5-point Likert scale (from "I completely agree" to "I don't agree at all"). Two subscales were derived: Maladaptive Impulsivity and Adaptive Impulsivity, each with four items.

3.2.7. Rosenberg's Self-Esteem Inventory (Study IV)

Rosenberg Self-Esteem Inventory (RSE) (Rosenberg, 1965) is a self-report questionnaire that measures self-esteem. The Estonian version (Pullmann & Allik, 2000) consists of 10 statements. In **Study IV**, a 3-point Likert scale (from "do not agree at all" to "completely agree") was used for the first three waves, while the original 5-point scale was applied in the last wave.

3.2.8. Perceived Sociocultural Pressure Scale (Studies III, IV)

Perceived Sociocultural Pressure Scale (PSPS) (Stice et al., 1996) is a self-report questionnaire with 9 items assessing perceived appearance-related pressure from family, friends, and the media. For females, the scale focuses on pressure to be thin, while for males, it focuses on pressure to be muscular. A 3-point Likert scale (from "never" to "often") was used.

3.2.9. Children's Eating Attitude Test (Studies III, IV)

Children's Eating Attitude Test (ChEAT) (Maloney et al., 1988) is a 26-item self-report questionnaire measuring children's eating attitudes and behaviors. The Estonian version (Polli, 2011) has 18 items and consists of four subscales: Food preoccupation (how much one think s/he can control thinking about food), Dieting (restricting food intake and foods high in calories), Body concerns (worrying about body weight and shape), and Pressure to eat (social pressure to eat). Items were answered on a 6-point Likert scale (from "always" to "never").

3.2.10. Children's Depression Inventory (Studies III, IV)

Children's Depression Inventory (CDI) (Kovacs, 1985; Estonian version Samm et al., 2008) is a 27-item self-report questionnaire assessing depression in children and adolescents. The scale consists of groups of statements, in which respondents choose the most accurate for them by rating it on a 3-point scale (0 indicates the absence of symptoms, 1 reflects moderate symptoms, and 2 indicates the presence of specific symptoms).

3.2.11. State and Trait Anxiety Inventory for Children (Studies III, IV)

State and Trait Anxiety Inventory for Children (STAI-C) (Spielberger, et al., 1973) was used to measure trait anxiety. The Trait anxiety subscale consists of 21 items, assessed on a 3-point Likert scale (from "almost never "to "often").

3.2.12. Child and Adolescent Perfectionism Scale (Study IV)

Child and Adolescent Perfectionism Scale (CAPS) (O'Connor et al., 2009) is a self-report questionnaire measuring perfectionism. Estonian version of the instrument (Kalde, 2011) consists of 13-items. In **Study IV**, a 3-point Likert scale (from "do not agree at all" to "completely agree") was used for the first three waves, while the original 5-point scale was applied in the last wave.

3.3. Methods

3.3.1. Latent profile analysis (Studies I, II, III)

Latent Profile Analysis (LPA) models heterogeneity in a population by identifying more homogeneous patterns based on selected variables (Gibson, 1959; Oberski, 2016; Vermunt & Magidson, 2002). In **Studies I**, **II**, and **III**, LPA was used to profile individuals based on perfectionism, impulsivity, and ED symptoms. Validation analyses included measures not used as indicators in LPA (e.g., BMI, depression, anxiety (**Studies I** and **II**), duration of disorder, and comorbid psychopathology (**Study I**)) and, in **Study III**, comparisons of the emerged profiles with DE symptoms and BMI assessed at earlier waves (Waves 1 and 2) relative to the profiling wave (Wave 3). In **Study II**, we compared alternative model specifications (e.g., constraining variances and covariances) and validated the best-fitting models using k-means clustering. More importantly, in **Studies I** and **II**, we addressed key methodological questions: whether to include both healthy controls and individuals with EDs in the same LPA, and whether to combine personality measures with state (DE) measures.

3.3.2. Growth mixture modeling (Study IV)

Growth Mixture Modelling (GMM) is a statistical method used to identify distinct subgroups within a population by examining interindividual differences in trajectories of intraindividual change over time (Van de Schoot, 2015; van der Nest et al., 2020). In **Study IV** GMM was used to model developmental trajectories of DE. The analysis allowed for the detection of distinct subgroups with different rates of change in DE behaviours. Validation analyses examined how these trajectories were associated with BMI, perfectionism, perceived social pressure to be thin or muscular, and other psychosocial risk factors.

4. RESULTS AND DISCUSSION

4.1. Latent profiles of disordered eating, perfectionism and impulsivity (Studies I–III)

The first aim of this dissertation was to identify more homogeneous subgroups of individuals based on dysfunctional and functional impulsivity, maladaptive and adaptive perfectionism, and ED symptoms (restrained eating, binge eating, purging, and preoccupation with body weight and shape). While the three main personality-based subtypes: overcontrolled, undercontrolled, and resilient, are well established in the ED literature (Gibson, 1959; Oberski, 2016; Vermunt & Magidson, 2002), questions remain regarding the possibility of identifying additional or more nuanced profiles (e.g., Krug et al., 2011; Thompson-Brenner et al., 2008). The findings from **Studies I** and **II** underscore the substantial heterogeneity in personality and behavioural patterns associated with ED symptoms. Notably, the emergence of a combined overcontrolled-undercontrolled profile (Boone et al., 2014; Slof-Op't Landt et al., 2016) raises further questions about whether the traditionally defined undercontrolled subtype might itself be differentiated into more specific and clinically meaningful profiles.

In **Study I**, five latent profiles (Figure 1) were identified based on perfectionism and impulsivity, each reflecting varying levels of ED symptoms. The **high functioning profile** was characterized by low levels of DE, low maladaptive perfectionism, low dysfunctional impulsivity, and high functional impulsivity. This combination suggests a resilient personality style, marked by flexibility, goal-directed behaviour, and effective emotion regulation. High functional impulsivity may support adaptive decision-making and responsiveness to environmental demands, contributing to psychological well-being. This profile is consistent with prior research linking functional impulsivity to positive outcomes and low psychopathology (Dickman, 1990). Although consistently identified across studies, this profile still raises questions – namely, what is driving and maintaining DE in that group of individuals. One possibility is symptom minimization or social desirability bias, particularly relevant as ED are often ego-syntonic (Gregertsen et al., 2017) and identity confusion has been proposed as a contributing factor in EDs (Croce et al., 2024). Alternatively, individuals in this profile may be influenced by unmeasured vulnerability factors. For example, Schaefer et al. (2024) found that individuals in a similar low-psychopathology profile showed elevated reward sensitivity (e.g., a strong focus on achieving a specific body ideal) and impaired feedback learning (persisting in maladaptive behaviours despite negative consequences).

The **purely perfectionistic** profile was characterized by high levels of both maladaptive and adaptive perfectionism and low levels of both functional and dysfunctional impulsivity. ED symptoms in this profile were most prominently expressed through dietary restraint and preoccupation with weight and shape. This pattern suggests a form of overcontrolled pathology in which individuals

strive for high standards while simultaneously fearing mistakes and external evaluation. The combination of perfectionistic strivings and concerns may contribute to rigid cognitive control strategies and inflexible behavioural routines, such as strict dietary rules and excessive control over eating. This cognitive-behavioural rigidity has been found to be particularly characteristic of individuals with restrictive forms of EDs (Dahlenburg et al., 2019), but also suggest to be a transdiagnostic factor in EDs (Egan et al., 2011; Fairburn et al., 2003). Importantly, high levels of perfectionism have been shown to predict chronicity in and are associated with poorer treatment response, particularly when perfectionism remains untreated (e.g., Halmi, 2013; Nilsson et al., 2008; van der Kaap-Deeder et al., 2016). These findings underscore the clinical importance of identifying perfectionism-driven ED profiles, as perfectionistic concerns may function both as predisposing factors and as maintaining factors for ED behaviours over time (Bills et al., 2023).

The **moderately impulsive** profile was characterized by moderate levels of both functional and dysfunctional impulsivity, low levels of adaptive and maladaptive perfectionism, and moderate to high ED symptoms. This profile reflects a classic undercontrolled subtype without elevated perfectionism and may include individuals who struggle with fluctuating control over eating behaviours. Such instability may contribute to inconsistent eating patterns, often driven by emotion regulation difficulties (Howells et al., 2024; Weinbach et al., 2018) or heightened reward sensitivity (Leehr et al., 2023; Murati et al., 2015). The co-occurrence of both functional and dysfunctional impulsivity may signal a shifting balance between adaptive spontaneity and vulnerability to reactive behaviours, which could help explain variability in ED symptoms. Clinically, this profile may map onto subthreshold or fluctuating ED presentations that may sometimes fall outside full diagnostic criteria, yet cause significant distress and impairment. For example, Stice et al. (2013), reported that many adolescents display partial or shifting ED patterns, underscoring the importance of identifying such intermediate phenotypes for early intervention.

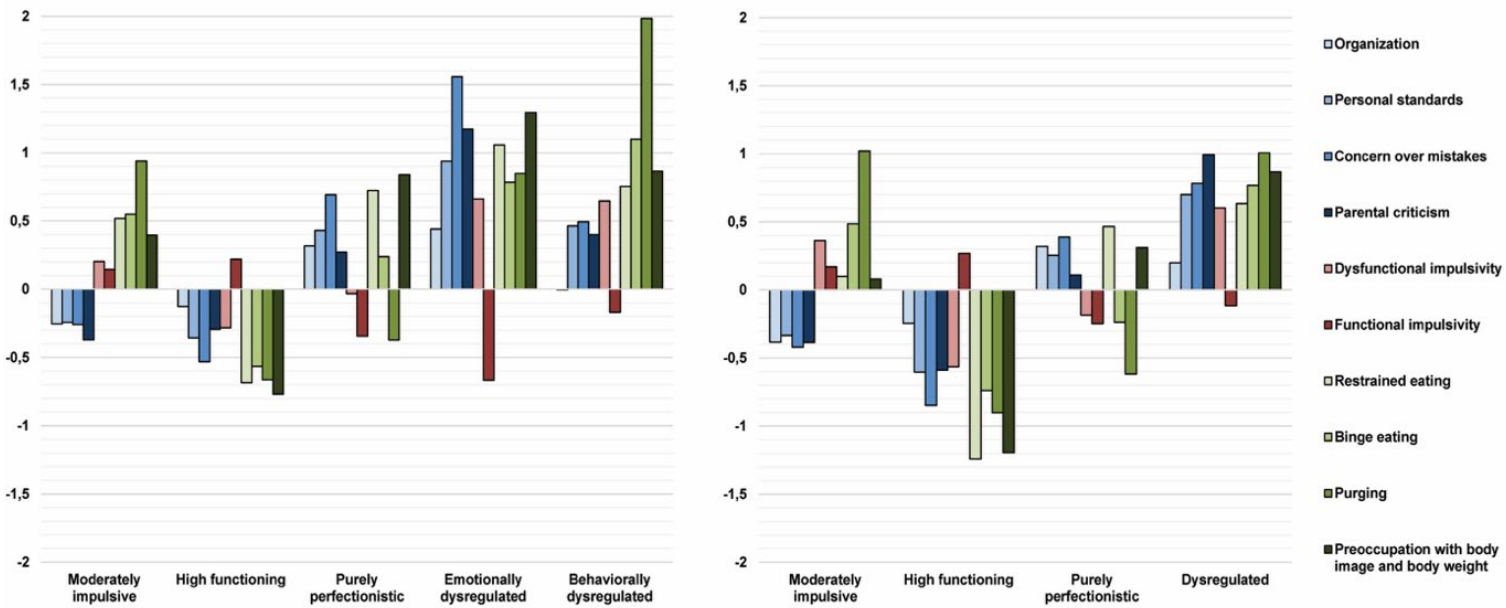

Figure 1. z-scores for Frost Multidimesional Perfectionism Scale, Dickman's Impulsivity and Eating Disorder Assessment Scale in the five and the four-class solution.

In **Study I**, two dysregulated profiles emerged. The **emotionally dysregulated** profile was characterized by high levels of maladaptive perfectionism, high dysfunctional impulsivity, and low functional impulsivity. Individuals in this profile also exhibited the highest levels of preoccupation with body weight and image and restrained eating, although binge eating and purging behaviours were also present. In contrast, the **behaviourally dysregulated** profile was marked by high levels of dysfunctional impulsivity, moderate levels of perfectionism, and the highest reported binge eating and purging. Preoccupation with body weight and restrained eating were also elevated. When the analysis was restricted to individuals with EDs, the emotionally and behaviourally dysregulated profiles converged into a single **dysregulated profile** (the four class solution in Figure 1). This raises the question of whether separating these profiles is empirically or clinically justified.

Although the emotionally dysregulated profile was relatively small (n = 16), which limits its statistical robustness, it nevertheless showed distinct clinical characteristics. Most notably, it had the highest rates of comorbid anxiety disorders (50%) and major depression (68.8%), indicating pronounced affective dysregulation. These findings align with research emphasizing the central role of emotional dysregulation in EDs, particularly in individuals with internalizing psychopathology (Lavender et al., 2015). By contrast, the behaviourally dysregulated profile was marked by 35% comorbid anxiety disorders, 52.5% major depression, and the highest prevalence of alcohol use disorder (32.5%). These findings are consistent with prior research identifying similar behavioural dysregulation patterns, particularly in binge-purge type EDs, and may help explain their frequent co-occurrence with substance use and impulse control problems (Hambleton et al., 2022a; Miniati et al., 2018).

Excluding small but meaningful profiles risks oversimplifying ED heterogeneity and missing opportunities for tailoring treatment (Bohane et al., 2017). Both profiles reflect variations of emotional dysregulation and difficulty balancing extremes of control and loss of control – paralleling patterns observed in individuals with emotionally unstable or borderline personality traits (Loxton & Gleaves, 2025; Sloan et al., 2017). While the emotionally dysregulated group may reflect more internalizing coping (e.g., perfectionism, dietary restraint), the behaviourally dysregulated group may externalize distress through impulsive behaviours like bingeing, purging, or substance use. It has been found that individuals with EDs use less adaptive and more maladaptive emotion regulation strategies and use more avoidance, rumination and, suppression (Puttevils et al., 2021). These divergent manifestations align with dual-process models of self-regulation (Hofmann et al., 2009; Strack & Deutsch, 2004), which describe two interacting systems: a reflective system, linked to long-term goals and self-monitoring (often overactivated in perfectionism), and an impulsive system, which is more reactive to emotional stimuli. When both systems are dysregulated, individuals may cycle between restrictive control and impulsive acting out, particularly under emotional distress (Gunn & Finn, 2015). This dual vulnerability could help explain the oscillation between restrictive control and

impulsive eating behaviours, as seen in these profiles. Thus, while both profiles exhibit emotional dysregulation, they may differ in whether this dysregulation manifests primarily through internalized control or outward behavioural expression – an interpretation supported by their differential comorbidity patterns and symptom profiles.

Additionally, both profiles showed the highest prevalence of post-traumatic stress disorder (PTSD). Comorbid psychopathology likely functions not only as a co-occurring psychopatholoty but also as a maintaining factor: depression, anxiety, and PTSD can heighten negative affect and disrupt regulation, thereby increasing reliance on maladaptive strategies such as restriction, bingeing, or purging (Aldao et al., 2010; Haedt-Matt & Keel, 2011). Consistently, individuals with trauma experiences have been found to exhibit broad emotion regulation difficulties, ranging from limited emotional awareness to impaired impulse control (Kuzyk et al., 2022), and emotion dysregulation has been identified as a key mediator linking childhood trauma to eating pathology (Moulton et al., 2015).

Finally, both profiles were characterized by elevated levels of both perfectionism and impulsivity – a particularly maladaptive configuration. While these traits are often conceptualized as opposing ends of a control continuum, their co-occurrence may create a destabilizing dynamic. For example, perfectionism may develop as a compensatory strategy to mask underlying impulsivity, whereas excessive self-control may paradoxically undermine regulation by depleting cognitive resources and thereby increase the likelihood of impulsive behaviour.This interplay may intensify rigidity, self-criticism, and emotional reactivity, fuelling cycles of DE. In addition, it illustrates the complexity of impulsivity's role in EDs, where it can either be mitigated or exacerbated by other contextual factors (e.g., Boone et al., 2014; Slof-Op't Landt et al., 2016). These findings underscore the clinical importance of identifying individuals in whom both traits are pronounced, and suggest that treating either in isolation may be insufficient.

Taken together, these results reinforce the heterogeneity of ED presentations and the clinical utility of identifying distinct personality-based subtypes. While the dysregulated profiles underscore the need to tailor interventions to emotional and behavioural patterns, questions remain about how stable and separable such profiles are across clinical contexts. Importantly, symptom fluctuations should not be mistaken for diagnostic change, as diagnostic migration is common in EDs and often reflects different expressions of the same underlying pathology (Schaumberg et al., 2019). This has led some to argue that EDs are best viewed as transdiagnostic in nature, with existing diagnostic categories being somewhat arbitrary (Fairburn et al., 2003). Supporting this view, OSFED and EDNOS cases frequently exhibit levels of psychopathology comparable to those with AN or BN (Dang et al., 2024), further challenging the boundaries between categories and underscoring the value of dimensional and person-centered approaches.

4.1.1. Robustness of latent profiles (Studies I, II)

A key methodological consideration in **Study I** was whether individuals with EDs diagnoses and healthy controls could be meaningfully included in the same LPA. We argue that this inclusion is not only justified, but preferable, particularly in light of the dimensional nature of DE (Luo et al., 2016; Wildes & Marcus, 2013b). Restricting the analysis to individuals with an ED diagnosis, or to specific diagnostic groups, as has often been done, would artificially reinforce categorical boundaries that may not reflect the true spectrum of DE behaviours and traits. Including individuals with varying levels of ED symptoms and diagnoses allows for the identification of transdiagnostic patterns and at-risk subgroups who may not meet formal diagnostic criteria but still experience clinically relevant impairments (Hay et al., 2023; Stice et al., 2013). This inclusive approach also enhances the generalizability of findings and more accurately captures the interplay between personality traits and DE symptoms across a broader population.

In **Study II** we aimed to answer the question of whether adding ED symptoms as indicators in LPA would be beneficial or not. In **Study II**, a four-profile solution again emerged as the best-fitting model. As in **Study I**, a combined perfectionism-impulsivity profile re-emerged (previously labelled as dysregulated), alongside subtypes characterized by predominantly high perfectionism or high impulsivity and the high-functioning type (low dysfunctional impulsivity and low maladaptive perfectionism). Profiles marked by elevated perfectionism tended to show higher levels of restraint and body image concerns, whereas those with pronounced impulsivity showed higher scores on all ED symptom measures – particularly purging. Despite partial data overlap between **Studies I** and **II,** the larger sample in **Study II** supported the robustness of earlier findings and offered greater statistical confidence in the profiles identified.

A key methodological advancement in **Study II** was the inclusion of ED symptoms as indicators (rather than distal outcomes) in the LPA. Theoretically, this approach reflects the bidirectional and pathoplastic relationships (Widiger, 2011) between ED symptoms and personality traits such as impulsivity and perfectionism. For example, starvation and chronic dieting have been shown to affect brain functioning, increasing rigidity, compulsivity, and emotional disturbances, thereby reinforcing perfectionistic or impulsive tendencies (Kaye et al., 2009). Preoccupation with body image may reinforce self-criticism and shame and perfectionistic concerns, which in turn increase DE behaviours as a vicious cycle (Hagerman et al., 2021; Steere & Cooper, 1993). This reciprocal shaping challenges the assumption that personality traits operate independently from ED symptomatology and supports the need for integrative, symptom-inclusive models. In addition, traits such as perfectionism and impulsivity may in part reflect state-dependent processes. For instance, perfectionism has been found to decrease with recovery from EDs (Bardone-Cone et al., 2010), while impulsivity, particularly negative urgency, also appears lower in individuals who have fully recovered compared to those with active disorders (Bardone-Cone et al., 2016). This highlights the importance of capturing phenotypic variation in

context, as including symptoms directly in the profile structure can therefore offer a more ecologically valid understanding of how these traits and behaviours manifest and interact.

In addition, the inclusion of ED symptoms as profile indicators in **Study II** contributed to clearer differentiation between subtypes and increased consistency across different analytic approaches. For example, the most constrained model specification (equal variances and covariances fixed to zero) yielded profiles closely aligned with those identified through cluster analysis and resulted in more evenly distributed profile sizes. This highlights the potential benefit of applying parameter constraints to improve interpretability and clinical relevance. Including ED symptoms also enhanced the prominence of impulsivity in differentiating profiles, reinforcing its role as a central mechanism in the development and maintenance of ED behaviours if combined with other factors (in this case perfectionism). In contrast, profiles derived from personality traits alone (perfectionism and impulsivity) showed limited predictive value for ED symptomatology. This finding aligns with Christian et al. (2021) who conducted an LPA using perfectionism and impulsivity dimensions in an undergraduate sample without including ED symptoms. Although they identified a range of personality-based profiles, these accounted for only 8% of the variance in binge eating and 5% in dietary restraint – suggesting limited clinical utility when ED symptoms are excluded from the model. Methodologically, if symptoms are only examined after the profiles are created, it can lead to misleading or inaccurate associations between profiles and clinical outcomes (Asparouhov & and Muthén, 2014). Therefore, including ED symptoms strengthens the profiles' clinical interpretability, reflects phenotypic complexity better, and avoids oversimplified assumptions about causality and trait independence.

4.1.2. Latent profiles and development of disordered eating (Study III)

While **Studies I** and **II** aimed to identify subtypes based on perfectionism, impulsivity, and DE symptoms in young adults, **Study III** extended this aim to an adolescent sample (mean age = 13.63, SD = 0.55) tackling developmental period when vulnerability to DE increases markedly (Aimé et al., 2008; Varela et al., 2023). Recognizing the underrepresentation of males in DE research, **Study III** included both genders to improve generalizability and address potential gender-specific patterns. Although the instruments used in Study III differed from those in **Study I** and **II** to ensure age-appropriate measurement, the overarching constructs remained consistent. This allowed for comparisons with the profiles derived in **Studies I** and **II**, particularly in assessing which configurations of traits and symptoms emerge early in development and how they might evolve into more established ED patterns in adulthood.

Study III supported a five-profile solution (Figure 2), including a **high functioning** profile characterized by low levels of maladaptive impulsivity, perfectionism, and DE symptoms. This profile was also consistently identified in

Studies I and **II**, despite different age groups and methodologies. Its repeated emergence suggests a relatively stable and resilient subgroup, potentially reflecting protective factors such as psychological flexibility and adaptive emotion regulation that buffer against the development of DE (Gilmartin et al., 2024).

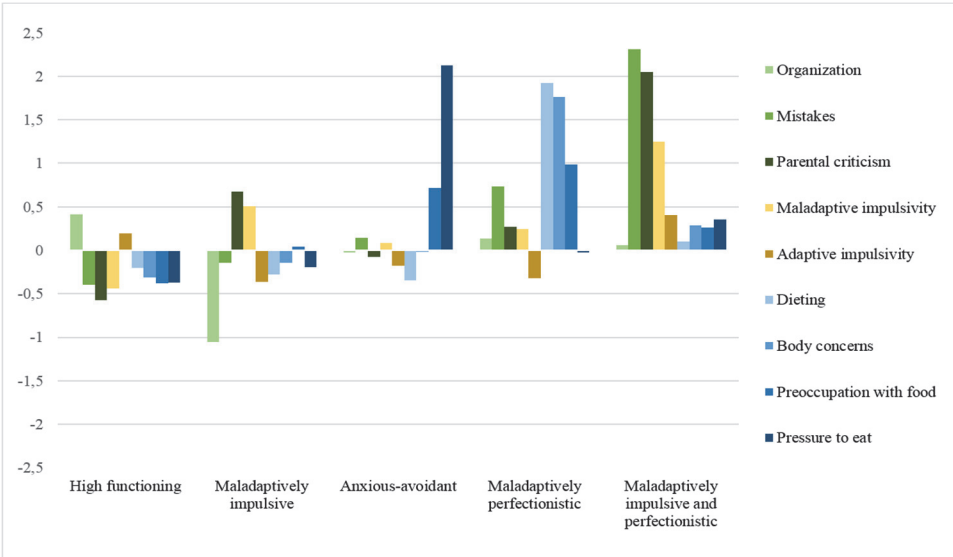

Figure 2. z-scores for questionnaires measuring dimensions of perfectionism, impulsivity, and disordered eating attitudes and behaviours in the five profile solution in adolescent sample.

The **maladaptively perfectionistic** profile in **Study III** was characterized by elevated perfectionism alongside the highest levels of body dissatisfaction, dieting behaviours, and food preoccupation, with 91.7% reporting attempts to lose weight. This group resembled the purely perfectionistic subtype in **Study I**, but showed the most pronounced DE patterns among adolescents. The **maladaptively impulsive** profile, by contrast, showed moderately elevated dysfunctional impulsivity, low organization, and high perceived parental criticism. Although DE symptoms were present, they were not prominent; these adolescents reported higher depression and trait anxiety. Finally, the **maladaptively impulsive and perfectionistic** profile combined high maladaptive perfectionism with high impulsivity. Adolescents in this group reported DE symptoms, but not to the same degree as those in the maladaptively perfectionistic profile. Instead, they showed the highest levels of anxiety and depression. The difference from adult samples (where a similar profile was linked to the most severe ED pathology) may partly reflect sample characteristics. **Studies I** and **II** focused on

individuals with EDs, while **Study III** used a population-representative adolescent sample that also included boys, introducing developmental and gender-related nuances.

Several factors may explain why adolescent findings differ from adult patterns, with developmental stage playing a central role. In adolescence, impulsivity is typically more diffuse and variable across individuals, and less directly tied to specific symptoms. This reflects the ongoing maturation of executive and regulatory capacities in the adolescent brain, which makes impulsivity a broad, transdiagnostic vulnerability rather than a behavior-specific driver (e.g., Freis et al., 2022; Romer, 2010; Shulman et al., 2016). It may first manifest in generalized emotional and behavioral difficulties, becoming more directly linked to maladaptive behaviours such as bingeing or purging later in development. Perfectionism, by contrast, appears to be a more robust construct earlier, often emerging in domain-specific ways such as appearance-related concerns, particularly when amplified by sociocultural pressures to be thin (Flett et al., 2002; Leone & Wade, 2018; Vecchione & Marsicano, 2024). Perfectionism can also function as a maladaptive control strategy in emotionally reactive youth, serving to manage perceived instability but at the cost of increased rigidity and self-criticism. Beyond traits alone, contextual factors such as body dissatisfaction, BMI, and perceived social pressure regarding appearance play a crucial role. Studies have shown that sociocultural pressure to be thin and thin-ideal internalization predict subsequent body dissatisfaction and negative affect, which in turn increase the risk for DE (Stice & Van Ryzin, 2019).

One profile that did not emerge in **Studies I** and **II** was the **anxious-avoidant** profile. This may partly reflect the different sample structure of those studies (individuals with diagnosed EDs and healthy controls), thereby limiting variability and reducing the likelihood of intermediate or subclinical patterns to appear – unlike the population-representative sample, which captured a broader spectrum of features and allowed subtler profiles to emerge. Although similar to the high-functioning profile in perfectionism and impulsivity, it was marked by high perceived pressure to eat, moderate food preoccupation, elevated trait anxiety, and the lowest BMI. This suggests that eating in this group may be driven less by body image concerns and more by the experience of stress or discomfort associated with eating itself. Although not directly overlapping, this profile resembles earlier internalizing subtypes, such as the avoidant-depressed profiles showing emotional constriction and low ED symptoms (Thompson-Brenner et al., 2008). Importantly, it also parallels features of ARFID, now formally recognized in the DSM-5 and ICD-11, where restrictive eating stems from anxiety, sensory sensitivity, or low interest in food rather than weight concerns (Fisher et al., 2014; Watts et al., 2023; Zimmerman & Fisher, 2017). Supporting this interpretation, children with ARFID report higher parental pressure to eat (Schmidt et al., 2019) and such pressure has been associated with picky eating as well as subsequent DE behaviours (Ellis et al., 2016; Jansen et al., 2017).
The emergence of the anxious-avoidant profile in **Study III** again illustrates how symptom-level indicators can uncover subtypes that would otherwise remain

obscured. For instance, inclusion of the ChEAT Pressure to eat subscale enabled detection of this profile, which may have otherwise been absorbed into the high-functioning profile. While this profile may superficially resemble low-symptom or subclinical subtypes, their internalizing features suggest meaningful psychological distress. In the absence of targeted tools assessing eating-related anxiety or social pressure, such individuals may be misclassified, potentially missing opportunities for early intervention.

Due to the limited sample size, formal gender comparisons should be interpreted cautiously. Among boys, the majority were classified into either the high-functioning (54.9%) or maladaptively impulsive (29.7%) profiles, with only 4-5% assigned to each of the remaining profiles. For girls, the distribution was more diverse: 49.3% were placed in the high-functioning profile while the rest were more evenly spread across the moderately impulsive (15.2%), anxious-avoidant (14.5%), maladaptively perfectionistic (13.8%), and maladaptively impulsive-perfectionistic (7.2%) profiles. This pattern suggests that DE and related personality traits may manifest with greater variability among adolescent girls, which aligns with previous findings highlighting higher rates of DE, body image concerns, and internalizing symptoms in girls (Breton et al., 2023; Brown & Keel, 2023; Culbert et al., 2021). However, given the small number of boys in some profiles, these differences should be interpreted with caution and require replication in larger samples.

4.2. Developmental trajectories of disordered eating (Studies III, IV)

In addition to possible core mechanism profiling, understanding how DE behaviours emerge and change over time is critical for improving early identification and intervention strategies. In **Studies III** and **IV**, we explored the developmental course of DE using person-centred approaches to capture heterogeneous symptom trajectories across adolescence. These analyses aimed to shed light on early risk patterns and potential pathways toward clinical EDs.

4.2.1. Preciding trajectories of disordered eating (Study III)

Linking the profiles to earlier developmental patterns of DE provided a preliminary validation of the identified subgroups in **Study III**. Using repeated measures ANOVA, we examined DE symptoms and BMI at ages 11.5 and 12.5, based on profile membership determined at age 13.5.

Analyses of DE in earlier waves revealed distinct patterns, providing preliminary validation for the identified profiles. Starting with, body concerns were consistently highest in the maladaptively perfectionistic profile, showing a noticeable increase between ages 12 and 14. This aligns with previous findings of stable or intensifying body dissatisfaction trajectories emerging during early adolescence (Lacroix et al., 2022). High maladaptive perfectionism may underpin

this early onset and stability, given evidence that children as young as seven can demonstrate elevated and stable perfectionistic tendencies (Hong et al., 2017). Such tendencies, especially when accompanied by low self-esteem, can negatively influence mental health and contribute to early emergence of DE behaviours (Morris & Lomax, 2014). Differences in dieting behaviors became apparent around ages 12–13, with scores declining in all groups except the maladaptively perfectionistic profile, where dieting remained high. Food preoccupation was relatively stable overall but rose sharply between ages 12 and 14 in the anxious-avoidant group, which also showed increasing perceived pressure to eat. This supports the interpretation of this profile as reflecting subclinical ARFID symptoms, characterized by conflict between external expectations and internal aversion toward eating.

In addition to investigating DE in earlier waves, we also examined BMI in the two years preceding profile assignment. BMI increased across all profiles but with consistent between-group differences: the maladaptively perfectionistic group had the highest BMI from the earliest measurement, while the anxious-avoidant group had the lowest throughout.

Overall, these analyses of earlier waves suggest meaningful early distinctions between the profiles, supporting their validity as distinct subgroups with potential clinical implications, although longitudinal follow-ups are needed to confirm their stability prospectively.

4.2.2. Developmental trajectories of disordered eating (Study IV)

While **Study III** provided insights into earlier assessment points of DE by examining prior symptom patterns based on the emerged profiles, **Study IV** enabled a prospective investigation of symptom development across adolescence. Using GMM, we identified distinct developmental trajectories of DE symptoms from ages 11 to 16, capturing heterogeneity in how symptoms evolved over time. The same sample as in **Study III** was used, but all four assessment waves were included.

The results revealed three trajectories of DE symptom development (Figure 3). The largest group, comprising nearly half of the sample (48.5%), followed a **medium-increasing** trajectory, characterized by a significant rise in symptoms. A second group (35.8%) followed a **high-stable** trajectory, maintaining elevated symptom levels throughout the four assessment waves. The third group (15.7%) followed a **low-stable** course, characterized by minimal symptoms at all time points. The proportion of adolescents in the high-stable group was somewhat higher than in comparable community-based longitudinal studies; for instance, Breton et al. (2022) identified a high-risk group comprising approximately 30.9% of adolescents who exhibited ED risk.

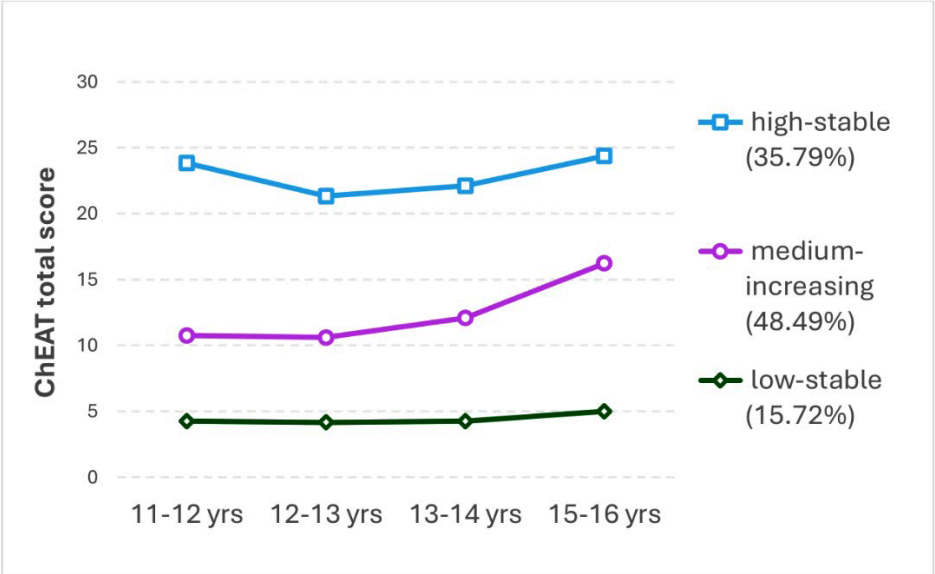

Figure 3. Developmental trajectories of disordered eating based on ChEAT total score.

When examining specific facets of DE, distinct developmental patterns emerged across subscales (Figure 4). For **body concerns**, three relatively stable trajectories were identified: high-stable (26.8%), medium-stable (46.7%), and low-stable (26.5%). This cognitive component was the only domain where symptom levels remained consistently stable within individuals across all waves, indicating that body dissatisfaction often emerges early and remains persistent throughout adolescence. This is consistent with previous findings showing that individual differences in body dissatisfaction can be observed as early as age 9 and tend to remain stable over time (Bodell et al., 2018).

For **dieting** behaviours three developmental trajectories emerged: low-stable (20.6%), medium-stable (71.8%), and high-increasing (7.5%). The notably high proportion of adolescents in the medium-stable group suggests that moderate levels of dietary restraint are prevalent during early adolescence. This prevalence may reflect the normalization of dieting behaviours in this age group, influenced not only by appearance-related concerns but also by broader health messages and sociocultural discourses promoting "healthy eating" and weight management. While such behaviours may initially appear benign or normative they can serve as an entry point for more problematic eating patterns (Weiss et al., 2023). As restrictive eating becomes more habitual, it can heighten orientation to appearance and reinforce body dissatisfaction, thereby intensifying dietary restraint. This dynamic contributes to a self-reinforcing cycle where initially moderate dieting progresses into more DE behaviours over time (Zarychta et al., 2017). Longitudinal studies have demonstrated that early dieting behaviours predict

futuure ED symptoms, underscoring the importance of early intervention (Neumark-Sztainer et al., 2011).

For **preoccupation with food**, two distinct trajectories were identified: a low-stable (67.2%) and a medium-increasing (32.8%), with a marked rise in the latter between ages 13 to 16 years. This pattern suggests that problematic eating-related attitudes intensify somewhat later, following the consolidation of body image concerns, whereas dieting behaviours differentiate earlier. The observed pattern may also indicate the early emergence of binge-purge type DE behaviours, particularly in individuals experiencing heightened food preoccupation following unsuccessful dietary restraint. Research supports that rigid dieting efforts can paradoxically increase the salience of food, leading to increased dysregulation, including loss-of-control eating episodes (Stice et al., 2017). This cycle of restriction and bingeing is a characteristic feature of BN, where initial impulsive behaviours can evolve into compulsive patterns over time (Pearson et al., 2015).

The **Pressure to eat** subscale yielded four developmental trajectories: no symptoms (13%), medium-decreasing (29.5%), high-decreasing (23.7%), and medium-increasing (33.8%). These decreasing trends may reflect the developmental shift toward greater autonomy in adolescence, during which youth assume more control over their eating behaviours and reduce reliance on parental regulation. However, the existence of a sizable increasing trajectory suggests that for some adolescents, perceived social or familial pressure to eat intensifies across this period. This pressure may be experienced as controlling or intrusive, particularly among adolescents with heightened sensitivity to external evaluation or anxiety around eating. Studies have shown that pressure to eat is linked to greater emotional distress around food, reduced intuitive eating, and increased risk for future DE behaviours (Ellis et al., 2016; Jansen et al., 2017). In vulnerable youth, such dynamics could contribute to food avoidance or restrictive patterns, particularly in a profile which is also characterized by anxiety and internalizing symptoms.

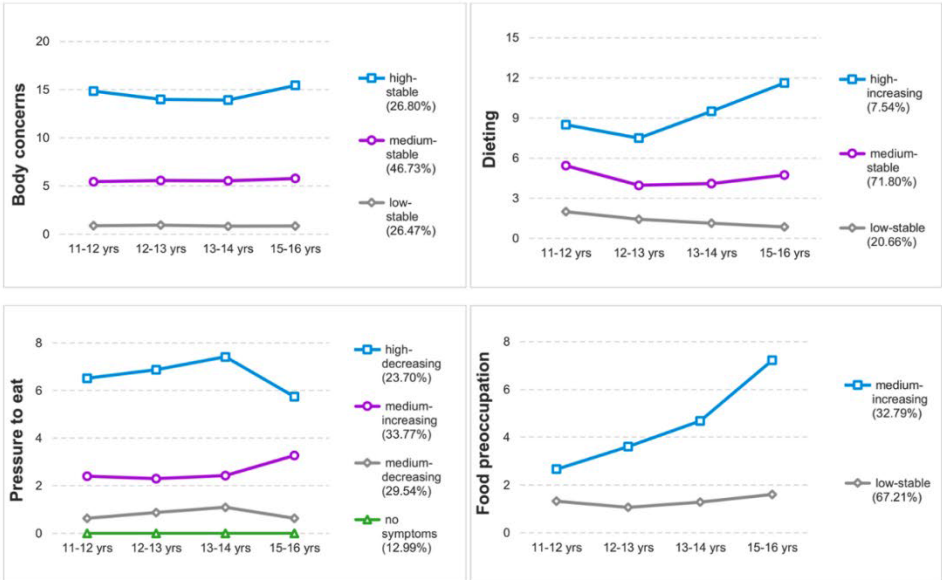

Figure 4. Developmental trajectories of disordered eating based on ChEAT subscales.

As anticipated, girls were disproportionately represented in in the high-risk trajectories, including the high-stable trajectory for body concerns, the medium-increasing trajectory for food preoccupation, and the high-decreasing trajectory for perceived pressure to eat. Importantly, a substantial minority of boys also appeared in elevated-risk groups (nearly 34% in the high-stable and 47% in the medium-increasing trajectories), indicating that boys tend to follow comparable developmental pathways, even if less frequently.

Gender differences also emerged at the subscale level, with girls again predominating in the high-risk trajectories for body concerns and food preoccupation. By contrast, dieting trajectories showed no significant gender differences. This pattern suggests that cognitive-emotional facets of DE (e.g., body dissatisfaction, food-related preoccupation/anxiety) may diverge more strongly by gender, whereas behavioural patterns such as dieting may be more uniformly distributed (or similarly reported) across genders. This could also reflect the increasing normalization of dieting during adolescence or indicate that the Dieting subscale's comparatively gender-neutral wording captures boys' DE patterns more effectively. These findings align with earlier research showing higher prevalence rates of DE symptoms among girls (Breton et al., 2023; López-Gil et al., 2023), but also point to the potential underestimation of symptoms in boys.

Indeed, a comparison of girls' and boys' mean scores across assessment waves showed that gender differences began to emerge around age 12.5 in body concerns (large effect) and preoccupation to eat (small effect), followed by differences in dieting (small effect) and food preoccupation (moderate effect) by

the age of 13.5 years. Given that most ED assessments have been designed and validated primarily primarily with women, it remains possible that current tools are less sensitive to men's concerns, such as muscularity-oriented body dissatisfaction or exercise-based compensatory behaviours (Gorrell & Murray, 2019; Murray et al., 2017). Thus, while gender differences likely reflect genuine disparities in prevalence and symptom expression, they may also partly result from measurement bias. Moreover, analysing boys and girls separately can obscure smaller but meaningful subgroups among boys; for example. Verschueren et al. (2020) identified only two trajectories in boys when modelling genders independently. In sum, larger and more gender-inclusive samples, paired with instruments that capture male-typical body ideals and behaviours, are essential for accurate characterization and early identification of DE in boys.

4.2.3. Predictors of high-risk developmental trajectories (Studies III, IV)

Building on the identification of distinct developmental trajectories in **Study IV**, the next step was to investigate factors contributing to an adolescent's likelihood of following a higher-risk developmental path. Understanding the predictors of these trajectories is essential for informing prevention and early intervention strategies. Therefore, **Study IV** also examined how psychosocial risk factors measured at the initial assessment (age 11) predicted membership in these trajectories.

Several psychosocial and trait-level variables significantly predicted membership in the high-stable trajectory. Specifically, higher BMI, being a girl, heightened perfectionism, and greater perceived sociocultural pressure to attain thinness or muscularity were among the strongest predictors. These results align with studies showing how sociocultural influences, particularly pressure to conform to appearance ideals, interact with vulnerabilities like perfectionism to elevate the risk of DE (Habashy & Culbert, 2019; Rosewall et al., 2018). For example, elevated BMI may amplify vulnerability by increasing the discrepancy between desired and actual body weight, heightening dissatisfaction, and thus rendering individuals more susceptible to other risk factors (Jung et al., 2017). In the medium-increasing trajectory, higher BMI, perfectionism, and female gender emerged as predictors. Unlike the high-stable trajectory, perceived sociocultural pressure did not independently predict membership. This absence may reflect measurement limitations or suggest that psychological traits such as perfectionism initially play a more dominant role, with external pressure becoming more influential only as symptoms intensify. It is also possible that sociocultural pressure interacts with underlying vulnerabilities, amplifying risk such that symptoms reach higher levels only when both are present.

Depression, anxiety, and self-esteem failed to independently predict trajectory membership when other factors were included, likely due to shared variance indicative of broader vulnerability to negative affect or neuroticism (e.g., Aldinger et al., 2014) These variables may also emerge as stronger predictors in

later developmental stages or more clinical populations, as seen in **Studies I** and **II** where anxiety and depression were prominent in high-risk ED profiles. Persistent DE behaviours such as restrictive dieting or binge–purge cycles can worsen mood, increase anxiety, and impair emotion regulation (Zhou et al., 2025). Moreover, more than half of individuals with clinically diagnosed EDs present with comorbid mood or anxiety disorders, underscoring the reciprocal reinforcement between ED behaviours and affective disturbances (Hambleton et al., 2022b). In early adolescence, DE symptoms may be driven primarily by body image concerns, sociocultural pressures, or perfectionistic control, whereas in later stages, affective dysregulation may become more prominent and mutually reinforcing.

The consistent emergence of perfectionism as a predictor across high-risk trajectories highlights its developmental and clinical importance. Research shows that maladaptive perfectionism predicts both the onset and persistence of ED symptoms (Bills et al., 2023; Johnston et al., 2018). Given its early emergence in childhood (Hong et al., 2017), perfectionism represents a key marker for early identification and intervention. Findings from **Study III** further demonstrate that perfectionism characterized the high-DE profiles, underscoring its persistent influence.

4.3. Practical implications

Findings from **Studies I–IV** can also offer directions for clinical assessment, intervention, and prevention. The consistent emergence of overcontrolled, undercontrolled, and resilient profiles (**Studies I, II, III**) across age groups and clinical contexts supports the incorporation of trait-based assessment into routine diagnostic procedures. Such assessments may improve the precision of case formulations and enable clinicians to tailor interventions according to individuals' self-regulatory tendencies. LPA further offers an intuitive and clinically interpretable approach as it captures heterogeneous, person-centred patterns rather than assuming homogenous effects across a population (e.g., symptom interrelationships or generalized linear effects) (Bills et al., 2023; Johnston et al., 2018). This person-centred approach reflects how clinicians often conceptualize individual patient presentations in practice and may provide a valuable foundation for personalized treatment planning.

Treatment planning can be refined by aligning interventions with the distinct regulatory styles identified. For example, overcontrolled individuals (characterized by high maladaptive perfectionism, rigid dietary restraint, and preoccupation with body image) may benefit from Enhanced Cognitive Behavioral Therapy (CBT-E; Fairburn et al., 2003)**,** which targets dysfunctional cognitions around eating and weight. More targeted approaches, such as Cognitive-Behavioral Therapy for Clinical Perfectionism (Shafran et al., 2002), could further address rigid standards and self-criticism, while Radically Open Dialectical Behavior Therapy (RO-DBT; Lynch et al., 2015) offers strategies for reducing excessive inhibitory control and social withdrawal. Emerging evidence

also suggests its promise for treating maladaptive perfectionism and EDs (for a review see Hatoum & Burton, 2024).

In contrast, individuals characterized by undercontrol (marked by heightened impulsivity, affective instability, and behavioural dysregulation) may be more responsive to standard Dialectical Behavior Therapy (DBT), which emphasizes emotion regulation, distress tolerance, and impulse control (Linehan & Kehrer, 1993). DBT has also been adapted for BN and BED (Safer et al., 2009) and even explored in the treatment of AN (Chen et al., 2015). However, ED-specific treatments should not be overshadowed, as neither DBT nor RO-DBT directly address central maintaining processes of EDs – preoccupation with body image and weight-related concerns. Speculations can also be made for other profiles, but such extensions remain a task for future studies and theoretical model building. Still, capturing both the how (self-regulatory style) and the what (symptom manifestations), provides a richer clinical picture for treatment matching and for identifying individuals who may need specialized care.

Beyond tailoring treatments to specific personality-based subtypes, it is also crucial to consider broader transdiagnostic processes that cut across profiles. Rather than relying on a simplistic mapping of overcontrol onto internalizing and undercontrol onto externalizing tendencies, **Studies I**, **II**, and **III** demonstrate that traits associated with both domains can co-occur within individuals. For example, both positive and negative urgency have been linked to internalizing symptoms (Gustavson et al., 2020) and perfectionism has also been associated with externalizing behaviors (Fuster et al., 2025). More broadly, emotion regulation difficulties emerge as a key transdiagnostic mechanism in EDs. A large-scale systematic review revealed consistent links between emotion regulation deficits and a range of ED presentations in adolescents, regardless of diagnosis (Zhou et al., 2025). Meta-analytic evidence further shows that maladaptive strategies such as rumination and suppression predict higher ED symptomatology, while adaptive strategies like reappraisal and emotional clarity are associated with fewer symptoms (Leppanen et al., 2022). Taken together, these findings underscore the central importance of emotion regulation processes in ED treatment, suggesting that incorporating such strategies could enhance treatment effectiveness across different self-regulatory profiles, whether inclined toward overcontrol or undercontrol.

Regarding prevention of EDs, findings from **Studies III** and **IV** highlight the need to initiate prevention efforts early, before maladaptive perfectionism and body image concerns become entrenched. Most prevention programs begin around age 12-13 (for a review of prevention programs see Koreshe et al., 2023), yet our results show that perfectionistic tendencies, and, to a lesser extent, impulsivity, are already present in early adolescence and are associated with DE. Early screening in schools or primary care, focused on perfectionistic concerns, body dissatisfaction, and perceived social pressure, could help identify adolescents at risk before these patterns solidify. Prevention approaches that integrate dissonance-based techniques (programs that reduce body dissatisfaction by encouraging participants to actively critique and challenge societal appearance

ideals) hold particular promise (e.g., The Body Project; see meta-analysis by Stice et al., 2021). In addition, emerging work on transdiagnostic early intervention highlights the importance of targeting common processes, including perfectionism, impulsivity, emotion regulation difficulties, and body image concerns. Because these domains cut across EDs, depression, and anxiety, addressing them may enhance the effectiveness of prevention efforts by focusing on shared mechanisms that drive risk across multiple disorders (Wade et al., 2025). Finally, while many existing programs have focused on girls, mixed-gender approaches that address diverse appearance pressures and promote flexibility may increase inclusivity and reach.

5. CONCLUSIONS AND FUTURE DIRECTIONS

The overarching aim of this dissertation was to advance the understanding of the heterogeneity and developmental course of ED symptoms by examining how personality traits, specifically perfectionism and impulsivity, and their co-occurrence contribute to individual vulnerability. These processes were investigated across clinical and non-clinical populations, encompassing both adolescents and adults. More specifically, the objectives were to: (1) identify latent profiles based on perfectionism, impulsivity, and ED symptoms to capture personality-based subtypes; (2) evaluate different analytical models and assess whether the inclusion of symptom indicators improves profile differentiation; (3) examine the developmental trajectories of DE during adolescence; and (4) investigate psychosocial predictors of trajectory membership.

The findings across the four studies demonstrate that perfectionism and impulsivity frequently co-occur in distinct configurations that are meaningfully associated with the severity of ED symptoms and comorbid psychopathology. **Study I** identified four to five latent profiles, including a subgroup marked by high maladaptive perfectionism and dysfunctional impulsivity, which showed the highest ED symptomatology and greater psychopathological comorbidity. These findings indicate that perfectionism and impulsivity are not mutually exclusive vulnerabilities but can interact in ways that intensify risk. **Study II** expanded on these results by comparing alternative profiling approaches and showed that combining trait and symptom indicators yields more clearly differentiated and clinically meaningful profiles than trait-based models alone. This supports the view that ED symptoms should not be conceptualized solely as consequences of underlying traits but also as important components in shaping individual-level vulnerability.

Study III applied the profiling framework to a large adolescent sample. The findings revealed that multidimensional profiles based on perfectionism, impulsivity, and DE symptoms are already evident in early adolescence. High perfectionism clustered with DE symptoms similarly to adult profiles, suggesting that it may serve as an early vulnerability marker. In contrast, impulsivity in adolescents appeared to be more broadly linked to anxiety and depressive symptoms, with less direct association to ED-specific pathology. A subgroup resembling ARFID also emerged, underscoring the importance of including ARFID-specific indicators in future profiling studies. Longitudinal comparisons of profile differences showed that body-related concerns were already present by age 11, while behavioral symptoms, such as dieting, tended to emerge later. This suggests that cognitive-affective aspects of DE may precede observable behaviours.

Study IV used growth mixture modeling to identify developmental trajectories of DE symptoms between ages 11 and 16. Three trajectories were found: low-stable, high-stable, and medium-increasing. Higher perfectionism, perceived

sociocultural pressure, and higher body mass index were associated with increased likelihood of belonging to the the high-stable and medium-increasing trajectories. Notably, dissatisfaction with weight and shape was already evident at age 11 years and remained stable throughout adolescence, reinforcing the need for early prevention efforts targeting body image concerns. Although girls were more likely to follow problematic trajectories, a substantial proportion of boys also belonged to these groups. This supports the decision to use mixed-gender analysis, which enabled the detection of meaningful risk patterns in boys – patterns that may have been overlooked in smaller, gender-stratified models.

Taken together, the findings across these four studies contribute to a growing body of evidence supporting person-centered and developmentally informed approaches to understanding EDs. The results emphasize the need to assess configurations of personality traits rather than isolated dimensions, and to integrate symptom indicators into profiling models. This work also suggests that ED symptoms are not only shaped by personality vulnerabilities but may function as active processes that contribute to the persistence and severity of DE. The results further highlight adolescence as a critical period in which body dissatisfaction and DE patterns begin to consolidate, especially among individuals with elevated perfectionism or heightened exposure to sociocultural appearance pressures. Identifying these personality-based risk profiles and tracking their development over time can support the creation of more targeted prevention and intervention strategies, with relevance across gender and developmental stages. Early screening, ideally before age 11, appears particularly important, as spontaneous remission of early-emerging DE is rare based on my findings. Traits such as perfectionism may serve as valuable early indicators of risk, particularly when accompanied by perceived social pressure and body image concerns.

While these findings offer several important insights, some limitations should be acknowledged. Although the studies relied on age-diverse samples and robust statistical methods, causal interpretations remain limited due to the exclusive use of self-report measures. The focus on perfectionism and impulsivity, while grounded in theory and supported by previous research, excluded other potentially relevant personality traits, such as those closely related to emotion regulation. The clinical sample was cross-sectional and relatively small, which may limit generalizability – particularly to individuals receiving care in outpatient settings. Moreover, cultural and gender-related differences warrant further investigation, especially given that boys also appear to follow high-risk DE trajectories. Finally, and most importantly, due to the exploratory nature of the dissertation aims, replication of these findings is essential.

Future research should continue to examine how personality traits and ED symptoms interact using longitudinal designs that are both developmentally and gender sensitive. It is important to investigate how traits such as perfectionism and impulsivity evolve over time and how they interact with environmental factors, in order to identify periods of heightened vulnerability and potential resilience. To deepen understanding of the mechanisms linking personality and DE, studies should integrate neurobiological, behavioural, and self-report data.

Incorporating multi-informant assessments may further improve the accuracy, particularly in cases where symptom minimization can be common. Research should also assess the stability and robustness of personality-based profiles by tracking possible individual transitions between them over time. Such work could clarify how stable or dynamic these configurations are across development and whether certain pathways lead to more chronic or severe outcomes. Intervention studies would benefit from examining whether tailoring approaches to personality-based subtypes enhances treatment outcomes, especially when introduced during the early stages of symptom development in adolescence. Finally, an important future direction is to identify protective factors that buffer against the development or persistence of DE, particularly in individuals showing early psychological risk markers.

In conclusion, this dissertation offers new insights into how trait configurations and symptom dimensions interact to shape the development and expression of DE across adolescence and adulthood. The findings support a move toward more individualized, developmentally informed, and personality-sensitive approaches in assessment, prevention, and treatment.

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SUMMARY IN ESTONIAN

Söömishäire sümptomite latentsed profiilid ja arengulised trajektoorid

Söömishäired (SH) on tõsised psüühikahäired, mida iseloomustavad ebatavalised söömiskäitumise mustrid (nt piirav toitumine, liigsöömishood, kompenseeriv käitumine tarbitud energiahulgu kulutamiseks), kehakaalu ja -kuju liigne tähtsustamine ning püsiv rahulolematus oma kehaga. Need häired toovad sageli kaasa olulisi füüsilisi, psühholoogilisi ja sotsiaalseid tagajärgi, mis mõjutavad inimese igapäevaelu ja heaolu. SH ja häirunud söömiskäitumine kujunevad kõige sagedamini noorukieas. Kuigi esineb teatavaid üldistavaid arengutrende, on uuringud näidanud, et SH sümptomite avaldumine ja kulg võivad erineda märkimisväärselt indiviiditi. Erinevate arengumustrite mõistmine on oluline, et paremini hinnata riske SH tekke kujunemiseks ja ajastada tõhusat ennetustööd.

Lisaks kliinilistele SH-dele (nt *anorexia nervosa*, *bulimia nervosa*, liigsöömishäire) on laialt levinud ka häirunud söömiskäitumine, mille puhul sümptomid ei ulatu psühhiaatrilise häire diagnoosi kriteeriumiteni, kuid mis võivad siiski oluliselt häirida indiviidi igapäevaelu ja suurendada SH tekke riski. Häirunud söömiskäitumist ja SH-d võib käsitleda kui sama nähtuse dimensionaalseid raskusastmeid, mida eristab mh esinemissagedus, intensiivsus ja mõju inimese toimetulekule. Lisaks on senised teadustööd esile toonud, et SH-d ei ole homogeensed – see tähendab, et sama diagnoosiga indiviidid võivad erineda sümptomite iseloomu, kaasuvate häirete, häire arengulise kulu ja ravivastuse poolest. Seetõttu on üha rohkem tähelepanu pööratud individuaalsetele riskiteguritele, sealhulgas isiksusejoontele ja nende koosmõjudele**,** mis võivad aidata täpsemini selgitada häire kestvust, kulgu ja prognoosi.

Käesolev doktoritöö keskendub sellele, kuidas isiksusejooned, eeskätt perfektsionism ja impulsiivsus, võivad mõjutada SH ja häirunud söömiskäitumise kujunemist ning väljendumist. Perfektsionism hõlmab nii kõrgete standardite seadmist (adaptiivne tahk) kui ka liigset muret vigade pärast ja enesekriitilisust (mitteadaptiivne tahk). Impulsiivsus viitab kalduvusele tegutseda kiiresti ja läbimõtlematult, eriti emotsionaalse pinge olukorras (düsfunktsionaalne impulsiivsus), ent sisaldab ka kiiret kohanemisvõimet ja reageerimisvalmidust (funktsionaalne impulsiivsus). Nii perfektsionism kui impulsiivsus on seotud kõrgema SH riskiga, kuid neid on harva uuritud koos, sest sageli nähakse neid vastandlikena. Doktoritöö töö uurib, kuidas nende koosesinemine võib kujundada eriliselt haavatava profiili SH kujunemiseks.

Lähtuvalt eelnevast oli doktoritöö eesmärkideks: (1) tuvastada isiksusejoontel (perfektsionism, impulsiivsus) ja SH sümptomitel põhinevad profiilid nii täiskasvanutel kui ka teismelistel; (2) hinnata, kas SH mitmekesisuse mõistmiseks on informatiivsem kasutada ainult isiksusejooni või ka SH sümptomeid; (3) kirjeldada häirunud söömiskäitumise arengutrajektoore noorukieas ning (4) uurida, millised psühhosotsiaalsed tegurid ennustavad kuuluvust erinevatesse häirunud söömiskäitumise arengutrajektooridesse.

Töö koosneb neljast omavahel seotud uurimusest (**Uurimus I–IV**), milles kasutati muuhulgas analüüsimeetodeid, mis võimaldasid tuvastada heterogeensetest valimitest sarnaste tunnuste ja mustritega alagruppe – nii läbilõikeliselt kui ka longitudinaalses vaates. Kõigis uurimustes rakendati eakohaseid enesekohaseid küsimustikke. Täiskasvanute uuringutes (**Uurimus I** ja **II**) osalesid SH diagnoosiga indiviidid ja terved kontrollisikud; noorukite uuringutes (**Uurimus III** ja **IV)** kasutati populatsioonipõhise longitudinaaluuringu andmeid, kus noorukeid hinnati neljal korral, vanuses 11–16 aastat.

Uurimus I tuvastas viis selgelt eristuvat profiili, mis erinesid nii isiksusejoonte, SH sümptomite taseme kui ka kaasuvate psüühikahäirete poolest. „Hästi funktsioneerivat" profiili iseloomustas vähene söömishäiretele omane sümptomaatika, madal perfektsionism ja kõrge funktsionaalne impulsiivsus. „Perfektsionistliku" profiili puhul esines kõrge mitteadaptiivne perfektsionism, keskmine SH sümptomite tase ja madal impulsiivsus. „Mõõdukalt impulsiivne" profiili puhul tuli esile kõrgenenud düsfunktsionaalne impulsiivsus, madal perfektsionism ja madal kuni mõõdukas SH sümptomaatika. Kõige ulatuslikumate SH sümptomitega „Düsreguleeritud" profiili iseloomustas samaaegselt kõrge mitteadaptiivne perfektsionism ja kõrge düsfunktsionaalne impulsiivsus.

Uurimus II võrdles lähenemisi, milles kasutati eraldi kas vaid isiksusejooni või lisaks SH sümptomeid. Uurimuse eesmärgiks oli hinnata, milline lähenemine võimaldab tuvastada selgemini eristuvaid ja kliiniliselt tähenduslikke profiile. Leiti, et kombineeritud mudel, milles analüüsiti koos perfektsionismi, impulsiivsust ja SH sümptomeid, võimaldas tuvastada sisuliselt eristuvamaid profiile ning vähendas metoodikast tulenevat varieeruvust, mis suurendas profiilide stabiilsust ja usaldusväärsust. Tulemused osutavad seega kaudselt ka sellele, et SH sümptomeid ei peaks käsitlema pelgalt häire tagajärjena, vaid ka oluliste profiile kujundavate komponentidena. See lähenemine rõhutab vajadust integreerida kliinilises hindamises paralleelselt nii isiksuseomadused kui ka sümptomipõhised näitajad.

Uurimus III keskendus noorukite isiksuse- ja söömiskäitumise põhiste profiilide tuvastamisele. Selgus, et ka selles vanuserühmas esinevad mitmekesised profiilid, milles perfektsionism ja impulsiivsus avalduvad erineval moel ning kombineeruvad SH sümptomitega. Täiskasvanutega sarnaselt ilmnes profiil, kus kõrge mitteadaptiivne perfektsionism kaasnes SH sümptomaatikaga. Samuti joonistus välja perfektsionismi ja impulsiivsuse kombineeritud profiil, mida iseloomustas häirunud söömiskäitumise esinemine, kuid mitte kõrgemal tasemel kui puhtalt perfektsionistlikus profiilis. See viitab, et noorukieas võib düsfunktsionaalne impulsiivsus avalduda pigem üldisema psühhopatoloogiana (näiteks kõrgema ärevuse ja depressiooni sümptomitena) mitte aga veel spetsiifilisemalt häirunud söömiskäitumise kaudu. Tulemused näitavad, et perfektsionismi seosed SH sümptomitega võivad avalduda juba varases eas, viidates selle potentsiaalsele juhtrollile riskiprofiilide kujunemisel, eriti noorukitel, kellel on kõrgem kehamassiindeks ja kes tajuvad tugevamat sotsiaalset survet vastata ühiskondlikele iluideaalidele.

Uurimus IV käsitles häirunud söömiskäitumise arengutrajektoore noorukieas (vanuses 11–16 eluaastat). Tuvastati kolm trajektoori: püsivalt madal häirunud söömiskäitumine, püsivalt kõrge häirunud söömiskäitumine ning mõõdukas, kuid ajas kasvav häirunud söömiskäitumine, mis süvenes eeskätt 14.–16. eluaasta vahel. Tüdrukud kuulusid suurema tõenäosusega kõrgema riskiga trajektooridesse, kuid nendesse kuulus märkimisväärsel hulgal ka poisse. Trajektooridesse kuulumist ennustasid kõrgem kehamassiindeks, kõrgem tajutud sotsiaalne surve olla kõhn või lihaseline ning kõrgem perfektsionism. Kehakuvandiga seotud SH sümptomite puhul ilmnes tähelepanuväärne tulemus: rahulolematusega kehakaalu ja -kuju puhul olid idenfitiseeritavad üksnes stabiilsed trajektoorid kogu uuritud perioodi vältel. See tähendab, et kõrge rahulolematus kehaga ilmnes juba 11-aastaselt ja püsis muutumatuna ka hilisematel aastatel, osutades vajadusele alustada ennetustööga võimalikult varajases eas.

Kokkuvõttes näitavad doktoritöö tulemused, et häirunud söömiskäitumine ja SH sümptomid esinevad mitmekesistes kombinatsioonides isiksusejoontega, eriti perfektsionismi ja impulsiivsuse erinevate tahkudega. Leiti, et teatud profiilid, nagu kõrge mitteadaptiivne perfektsionism koos düsfunktsionaalse impulsiivsusega, kuid ka kõrgem perfektsionism üksinda, on seotud ulatuslikuma SH sümptomaatika ja kõrgema kaasuva psühhopatoloogia riskiga. Tulemused toetavad arusaama, et SH sümptomid ei ole vaid isiksuslike haavatavuste tagajärg, vaid võivad toimida ka aktiivsete mehhanismidena, mis mõjutavad häire kulgu ja raskusastet. Samuti ilmnes, et haavatavusprofiilid on tuvastatavad juba noorukieas ning SH sümptomite areng võib kulgeda väga erineval moel. Eriti püsivaks osutus rahulolematus kehakaalu ja -kujuga, mis avaldus juba 11-aastaselt ja püsis nendel noorukitel stabiilsena ka edasistel aastatel. Töö toob esile vajaduse diferentseeritud lähenemise järele nii SH ennetuses, hindamises kui ravis, rõhutades vajadust arvestada individuaalseid riskimustreid ja arengulisi eripärasid.

PUBLICATIONS

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Soodla, H., Soidla, K., & Akkermann, K. (2024). Reading tea leaves or tracking true constructs? An assessment of personality-based latent profiles in eating disorders. *Frontiers in Psychiatry*, *15.* doi: 10.3389/fpsyt.2024.1376565

Soidla, K., Reintam, K., & Akkermann, K. (2025). Developmental trajectories of disordered eating in boys and girls and their associations with eating disorder risk factors. *Eating Disorders*, 1–27. https://doi.org/10.1080/10640266.2025.2540293

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Soidla, K. & Akkermann, K. (2020). Perfectionism and impulsivity based risk profiles in eating disorders. *International Journal of Eating Disorders*, 53 (7), 1108–1119. https://doi.org/10.1002/eat.23285

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