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Mindset characteristics and mindset intervention effects in adolescents with intellectual disabilities

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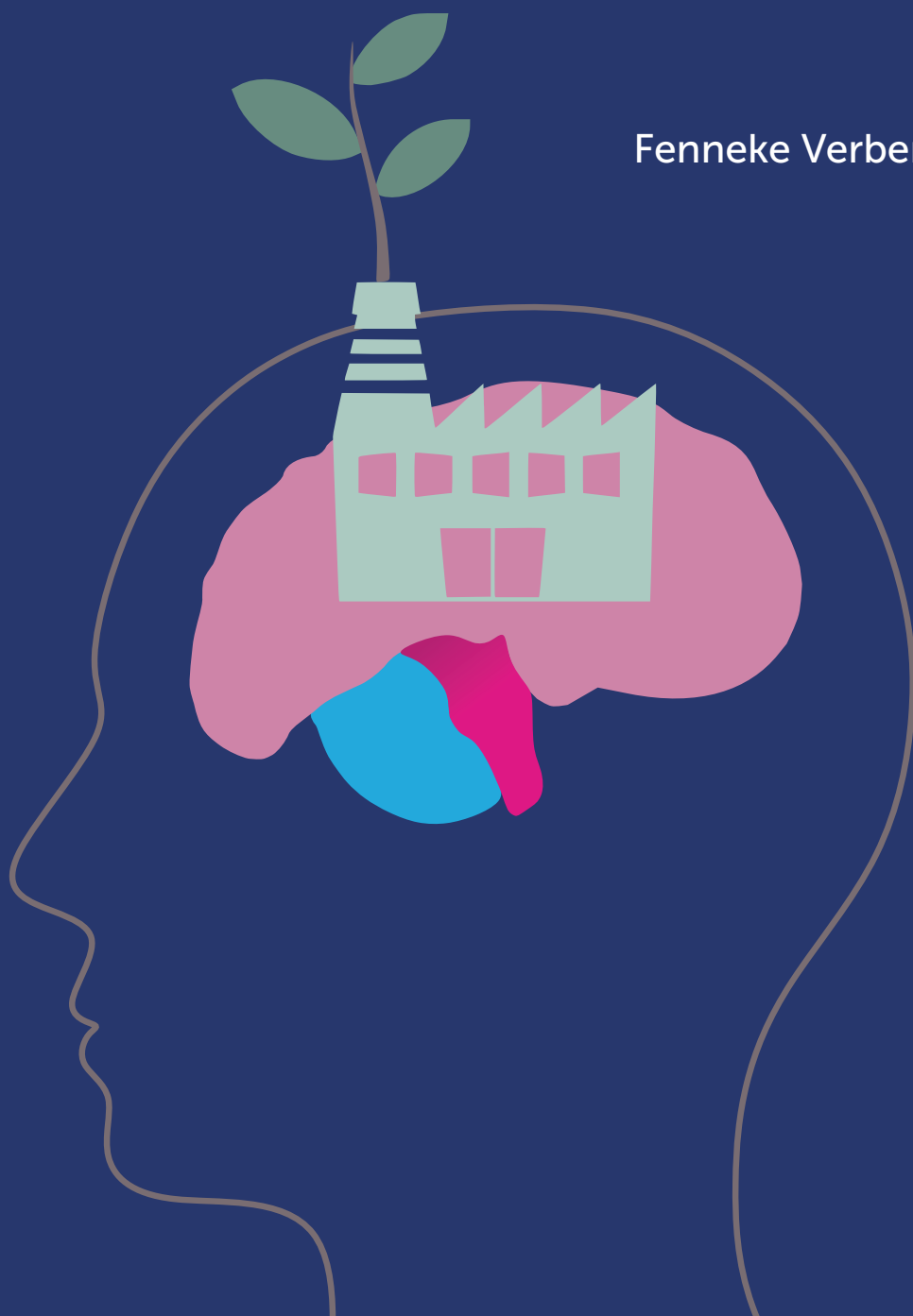
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Change Your Mindset!

Mindset characteristics and mindset intervention effects in adolescents with intellectual disabilities

Fenneke Verberg



Change Your Mindset!

**Mindset characteristics and mindset intervention effects
in adolescents with intellectual disabilities**

door

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Change Your Mindset!

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in adolescents with intellectual disabilities**

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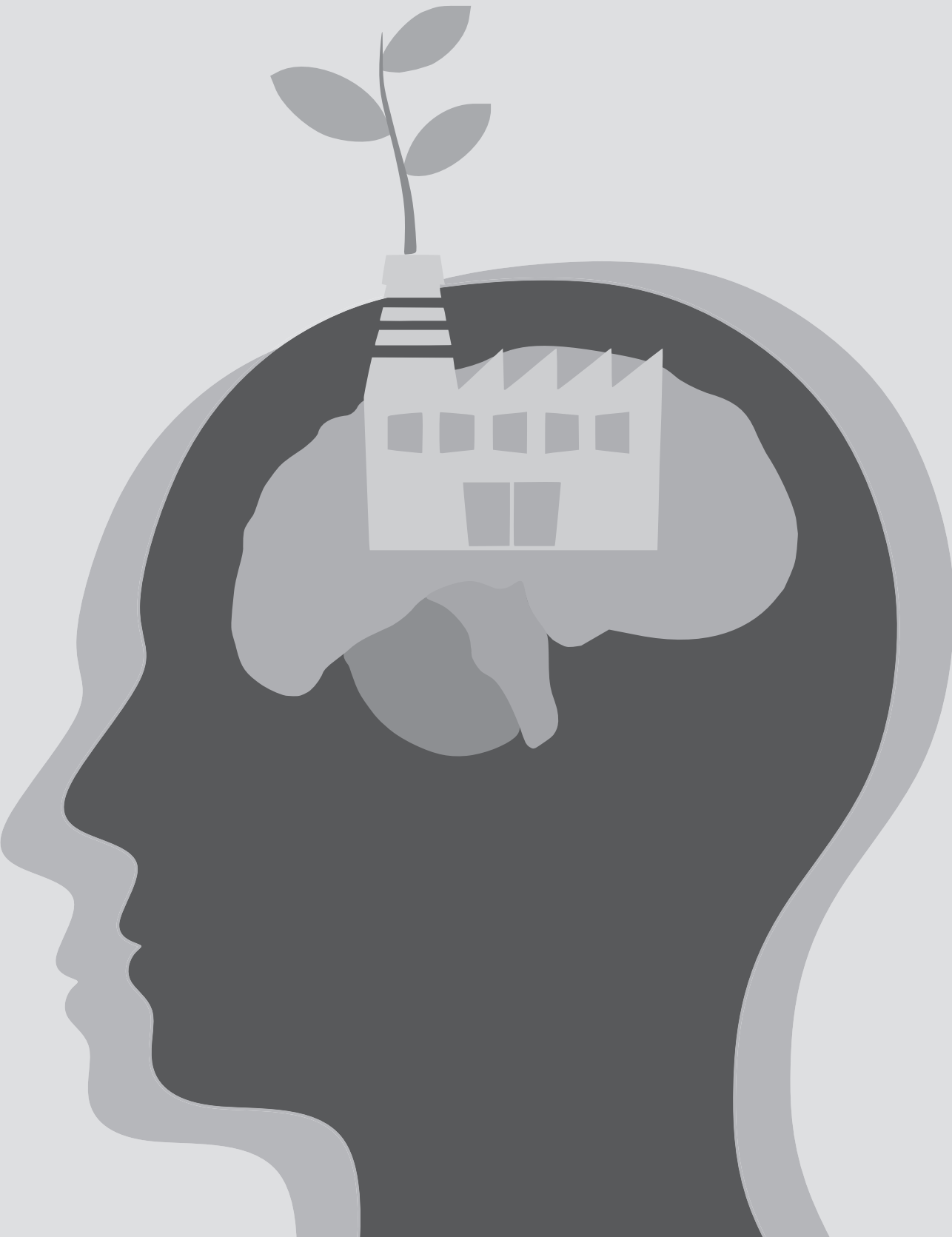
Faculteit der Maatschappij- en Gedragwetenschappen

“Wow, here is a chance to grow”

Carol S. Dweck

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Chapter 1

General Introduction



Youth with intellectual disabilities form an at-risk population. Research on youth with intellectual disabilities shows increased rates of comorbid physical and mental health problems (e.g., Cooper et al., 2015; Dekker & Koot, 2003; Munir, 2016). Prevalence studies indicate that youth with intellectual disabilities are three to seven times more likely to develop emotional and behavioral problems, such as depression and aggression, when compared to their peers without intellectual disabilities (e.g., De Ruiter et al., 2007; Dykens, 2000; Einfeld et al., 2011). These mental health problems have unfavorable consequences for both youth and their environment. Besides societal costs due to frequent use of assistance and social services, untreated mental health problems often go hand in hand with social problems, reduced societal participation, and higher rates of comorbidity (e.g., Didden, 2005; Didden et al., 2006; Heyveart et al., 2010; Schomevus et al., 2018).

Research in the general population has shown that implicit theories, or so-called mindsets, can function as a protective or risk-enhancing factor in life, impacting the academic, as well as psychosocial development of youth (Blackwell et al., 2007; for meta-analytic reviews, see Burnette et al., 2020; Schleider et al., 2015). In this dissertation, mindset is defined as *'the fundamental belief in the malleability of personal traits and attributes, such as intelligence, personality, and behavior'*. On a continuum, some people hold a relatively fixed mindset (the belief that attributes are static and uncontrollable), whereas others hold more of a growth mindset (the belief that attributes can develop and change; Dweck, 1999). Furthermore, in this dissertation, psychosocial functioning is operationalized as empowerment, mental health (i.e., internalizing, externalizing, attention problems), and self-esteem.

Stimulating a growth mindset may be a promising approach to improve psychosocial functioning in people with intellectual disabilities. Yet, studies and evidence-based mindset interventions tailored for this at-risk population are non-existent. Therefore, the objective of the present dissertation was to extend the knowledge about the concept of mindset in youth with mild to borderline intellectual disabilities by (1) examining the mindset and its association with psychosocial functioning and (2) developing and examining the feasibility, satisfaction, and effectiveness of a novel online mindset intervention for youth with intellectual disabilities. In describing the research outcomes related to these goals, the present dissertation contributes to the evidence-based treatment, improving psychosocial functioning in youth with a (borderline) intellectual disability (IQ 50–85).

Intellectual Disabilities

Over the years, an intellectual disability has been defined in several ways. One of the leading sources of definitions for intellectual disability, which is generally used in the Netherlands, is the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013). In accordance with the DSM, we consider an intellectual disability as *'a disorder characterized by significant deficits in both intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills, with an onset during childhood or adolescence'*. According to the DSM-IV

(APA, 1994, 2000), there are different terms reflecting the severity of the intellectual impairment, which range from profound (IQ under 20), severe (IQ 20–35), moderate (IQ 36–49), to mild intellectual disability (IQ 50–69). In addition, borderline intellectual functioning is referred to as a condition that may be a focus of clinical attention when people have an IQ range from 70–85. However, the DSM-5 (APA, 2013) shifted away from primary reliance on IQ scores to determine the severity of the disability towards a focus on adaptive functioning (i.e., conceptual, practical, and social adaptive functioning), thereby yielding better diagnostic constructs with greater clinical relevance. In addition, borderline intellectual functioning is no longer specified with an IQ score range (APA, 2013).

Prevalence rates of intellectual disabilities vary considerably because of diverse terminology and study samples (Maulik et al., 2011; WHO, 2007). Based on the World Health Organization population prevalence estimate, the prevalence of people with intellectual disabilities worldwide is close to 1%. In the Netherlands, mild intellectual disability involves approximately 2.1% of the population, whereas the prevalence of people with borderline intellectual functioning varies between 2.4% and 7.6% (Woittiez et al., 2019). In total, approximately 1.1 million people are classified with mild to borderline intellectual disabilities (Woittiez et al., 2019). Unlike other countries, in the Netherlands, individuals with borderline intelligence with severe limitations in adaptive functioning are eligible for access to healthcare and special education systems for individuals with intellectual disabilities. Therefore, this dissertation focuses on youth with mild intellectual disabilities and borderline intellectual functioning, referred to as mild to borderline intellectual disabilities, including youth with an IQ between 50 and 85 with problems in their adaptive functioning. In addition to having an intellectual disability, the participants in the studies presented in this dissertation could have comorbid physical disabilities and/or psychiatric problems. Furthermore, all participants in the studies presented in this dissertation were attending special education schools or residential health care.

Mindset

Why do some people give up when faced with adversity while others persist? And why do some thrive when challenged, while others with equal abilities prefer to stay in their 'comfort zone'? Two fundamentally different assumptions, or 'mindsets' about the malleability of human attributes, may cause these differences (Dweck, 1999). One's mindset consists of fundamental and often unconscious beliefs regarding whether or not personal traits and attributes can change (Dweck, 1999; Dweck & Leggett, 1988).

On a continuum, and varying across domains, people can either have a more fixed mindset or a mindset that leans more towards growth. People with a fixed mindset believe personal attributes are innate and uncontrollable, while people with a growth mindset assume that these attributes are dynamic and can be developed over time (Dweck, 1999; Dweck & Leggett, 1988; Molden & Dweck, 2006). Subsequently, one's mindset provides a lens through which people ascribe meaning to events, which affects how they interpret and respond to situations in all aspects of their lives, particularly under conditions of challenge and setbacks (Blackwell et al., 2007). In this dissertation we

have examined two mindset domains, more specifically the mindset of intelligence and the mindset of emotion and behavior.

Mindset, Perseverance, and Psychosocial Functioning

Mindset is related to an array of self-regulatory processes in terms of attributions and reactions to effort, failure, and challenges, henceforth referred to as perseverance (Burnette et al., 2013; Mrazek et al., 2018; Sisk et al., 2018). In particular, people with a fixed mindset will interpret failure as a lack of ability and will generally feel helpless to change their circumstances. In contrast, when people believe in the malleability of their traits and attributes, they will be more eager to learn, put in effort to improve abilities and reverse setbacks, and embrace challenges as opportunities to grow (Blackwell et al., 2007; Dweck, 2006; Dweck & Leggett, 1988). In this dissertation, with the term mindset we refer to the mindset domains 'intelligence', and 'emotion and behavior', as well as to the closely related concept perseverance.

Extensive evidence repeatedly demonstrated the advantage of a growth mindset over a fixed mindset in the academic domain (e.g., Blackwell et al., 2007; Claro et al., 2016; Paunesku et al., 2015). In recent years, considerable evidence has accumulated to indicate the distinct advantage of a growth mindset in the mental health domain on account of its ability to provide a buffer against psychological distress and mental health problems such as stress and low self-esteem (Burnette et al., 2020; Schleider et al., 2015; Schroder et al., 2015). For example, a meta-analysis of 17 studies revealed that youth with a fixed-oriented mindset were more likely to experience internalizing and externalizing problems, compared to youth with a growth-oriented mindset (Schleider et al., 2015).

Interestingly, research has demonstrated that mindset interventions generally stimulate a growth mindset and perseverance (e.g., Burgoyne et al., 2018; Mrazek et al., 2018; Schleider & Weisz, 2016b; Yeager et al., 2013), with downstream effects on mental health, empowerment, treatment amenability, and alliance (Miu & Yeager, 2015; Salekin et al., 2012; Schleider & Weisz, 2016b, 2020; Shirk & Saiz, 1992; Van Tongeren & Burnette, 2018; Yeager et al., 2013). Despite these promising findings of mindset interventions among the general population, some inconsistent or non-significant findings on academic and mental health outcomes have recently been reported as well (Calvete et al., 2019; Foliano et al., 2019; Sisk et al., 2018).

Mindset and Youth with Intellectual Disabilities

Youth with intellectual disabilities are more likely to hold feelings of inferiority, incompetence, and struggle with mental health problems than their non-disabled peers (e.g., Didden, 2015; Dykens, 2000). Therefore, developing a growth mindset may be particularly important for this population. However, in contrast to the large body of literature on mindset in the general population, the growth mindset concept and its potentially beneficial effects on mental health are almost unexplored in the population of people with intellectual disabilities.

Only two studies have investigated the mindset of youth with intellectual disabilities. Results indicated that youth with intellectual disabilities are more likely to endorse a fixed mindset of intelligence compared to peers without intellectual disabilities (Baird et al., 2009; Koestner et al., 1995). In addition, regarding the closely related concept of perseverance, previous research showed that youth with intellectual disabilities are more inclined to prove their ability rather than gain an opportunity to develop their abilities (Baird et al., 2009). Also, youth with intellectual disabilities interpret the exertion of effort as evidence of limited ability compared to peers without intellectual disabilities (Baird et al., 2009; Koestner et al., 1995). Finally, despite the fact that mindset interventions have shown to be generally promising in youth without intellectual disabilities, interventions and thus effectiveness studies on mindset interventions for youth with intellectual disabilities are still missing. Only one previous study investigated the effect of a mindset manipulation in this population, showing a positive impact on challenge seeking among youth with intellectual disabilities (Koestner et al., 1995).

Thus, given this gap in the literature and the potential promising effects of mindset interventions, it is of crucial importance to explore the hypotheses that youth with intellectual disabilities can benefit from a growth mindset, as well as from mindset interventions. This is especially relevant given the suggestion that malleability beliefs of intelligence operate independently of cognitive ability (Baird et al., 2009; Schleider & Schroder, 2018). Moreover, several studies have shown a mindset intervention to be mainly effective for high-risk target groups, such as poorly performing students, students from negatively stereotyped groups, or minority groups (Aronson et al., 2002, 2009). As youth with intellectual disabilities often suffer from feelings of inferiority and incompetence (Dykens, 2000; Koestner et al., 1995), their disability could also be a stereotype threat and lead them to conclude their intelligence and behavior are fixed abilities. Therefore, youth with intellectual disabilities may especially benefit from enhancing a growth mindset.

In sum, notwithstanding some recent inconsistent findings (Calvete et al., 2019; Foliano et al., 2019; Sisk et al., 2018), mindset interventions have generally shown promising results for youth without intellectual disabilities, especially for youth from disadvantaged populations. Therefore, understanding and stimulating a growth mindset among youth with intellectual disabilities addresses an important gap in the literature. A tailored mindset intervention may be a potentially successful endeavour to improve psychosocial functioning in this at-risk population. This is why we developed the online mindset intervention *The Growth Factory* specifically for youth with intellectual disabilities.

Mindset Intervention *The Growth Factory*

The Growth Factory is an online intervention that aims to empower adolescents with intellectual disabilities by fostering a growth mindset. It builds on scientific research on implicit self-theories and mindset interventions by Carol Dweck and David Yeager (Dweck, 1999; Yeager et al., 2013, 2016). The six sessions of *The Growth Factory* are structured around the key growth mindset affirmations (Dweck, 1999; Yeager & Dweck, 2012) by emphasizing: 1) the potential for brain plasticity, 2) the assumption that one's

characteristics are malleable and have the potential to change, 3) that people are personally in charge of this process by teaching the formula for successful change: effort, strategies, and help from others, and 4) that change is neither easy nor certain and may only happen over time—but is usually possible. Besides animations, interactive assignments, movie clips of successful role models, and “saying-is-believing” exercises, The Growth Factory contains exercises based on the principles of cognitive behavioral therapy (Aronson et al., 2002; Yeager & Walton, 2011).

The Growth Factory was developed with youth with intellectual disabilities and professionals, using the guidelines for effective interventions for people with intellectual disabilities (De Wit et al., 2011). By choosing an online approach, we were able to meet the information processing needs of youth with intellectual disabilities, such as using visual and auditory support, and providing a structured learning environment with the possibility to repeat parts or making use of extra advice. Special care was taken to increase the likelihood that participants would identify with one of the avatars or ‘buddies’ guiding the participants throughout the intervention by creating avatars with different characteristics, and by creating role models in the video-clips whose stories and struggles matched those oftentimes reported by youth with intellectual disabilities and professionals (Binning et al., 2018; Yeager & Walton, 2011). Additionally, youth were allowed to personalize their responses by choosing their own topic in an assignment, so intervention materials evoked the intended experience in the way that was most relevant to them (Yeager & Walton, 2011). In addition, to improve the transfer from The Growth Factory into daily life, we integrated role play, biweekly reminders, and homework assignments, as for people with intellectual disabilities, new learning needs practice and repetition to become established (De Wit et al., 2011). In Table 1, we provide a detailed description of the development, structure, and content of The Growth Factory. To see a preview of the intervention you can go to the website of The Growth Factory (<https://degroEIFabriek.pluryn.nl>).

Table 1*Content of the Online Mindset Intervention The Growth Factory*

Session	Content
1. Learning something new	Plasticity of the brain. The brain is like a muscle that gets stronger and works better the more it is exercised. Your brain forms new connections, and connections get stronger every time you practice.
	Assignment 1: Practice with the brain (e.g., 'The brain consists of a lot of connections. Click on a connection in the head', and 'What would you like to improve? Click on the brain and form new connections').
	Assignment 2: Answer 'How is it possible we can learn something new or become better?'
2. Mindset	The concept of mindset and the difference between a fixed and growth mindset in terms of the role of effort, reactions to setbacks, and criticism from others.
	Assignment 1: Choose between sentences related to either a growth or fixed mindset.
3. Growth Mindset: Effort, setbacks, and criticism	Assignment 2: What mindset do you have? Choose between 'growth', 'fixed', and 'a bit of both'.
	Assignment 3: Write down 2 or 3 things you have learned since you grew up.
	Benefits of a growth mindset: a different perspective on effort, setbacks, and criticism from others. The term 'growth thoughts' is introduced. Peer role models: video clips Mycha and Tim.
	Assignment 1: Practise with growth thoughts about effort, setbacks, and criticism from others.
	Assignment 2: Choose between two sentences and pick the growth thought of Mycha and Tim.
	Additional exercise based on the principles of cognitive behavioral therapy: Practice with a situation to learn the different impact of a 'growth and fixed thought' on feelings and behaviors.
4. Recipe for Growth, part 1+2: Effort and good strategies	Becoming aware of the need for effort and finding an adequate strategy to develop and accomplish goals. Peer role models: video clips Floor and Patrick.
	Assignment 1: Click on all words related to effort and answer 'Describe a situation where you tried different strategies to reach your goal'.

	Assignment 2 (Floor): Can you think of a strategy for yourself that makes you calm?
	Assignment 3 (Patrick): Write down a setback you have ever had. 'Which growth thoughts could help you deal with your adversity?' and 'Which strategy could help you deal with this setback?'
	Additional exercises based on the principles of cognitive behavioral therapy: Practise with your own situation by changing a fixed thought into a growth thought to see the impact on feelings and behavior. Select three of six statements that are true about thoughts and growth thoughts.
5. Recipe for Growth, part 3: Help from others	Becoming aware that sometimes it is necessary and can be rewarding to ask for help. Learn to ask for help in an appropriate way using the 5-step plan. Peer role models: video clips Janka and a compilation video where youth discuss the benefits of asking for and accepting help.
	Assignment 1: Choose the growth mindset sentences related to asking for help and pick the sentences helpful for yourself.
	Assignment 2 (Janka): Choose between 'making a difficult assignment for school' or 'not getting angry so quickly' and practise the 5-step plan to ask for help.
	Assignment 3: Answer 'Where did you ever get help?', 'Whom did you ask for help?', 'Did you get help immediately?', and 'Did you like to get help?'
	Assignment 4: Explain to others why it is good if you can ask for and accept help from others.
	Additional exercise: Practise the 5-step plan to ask for help in a role play.
6. Freshen up	Repetition of the most important information through a compilation of the previous sessions.
	Assignment 1: Click on all terms belonging to a growth mindset. Drag them to the stairs and climb to your goal.
	Assignment 2: 'What would you like to learn?' Reach this goal by using each step of the growth recipe.
	Assignment 3: Write down as many things that you have learned and want to remember from The Growth Factory.
7. Booster session	Repetition of session 6.

Aims and Overview of the Present Dissertation

In this dissertation, several studies were conducted to add to the existing knowledge about the concept of mindset in youth with mild to borderline intellectual disabilities by (1) examining the mindset and its association with psychosocial functioning and (2) developing and examining the feasibility, satisfaction, and effectiveness of a novel online mindset intervention for youth with intellectual disabilities. The ultimate goal of this dissertation was to examine the effectiveness of The Growth Factory in a randomized controlled trial (Chapter 5).

- **Chapter 2** explores the relationship between mindsets and psychosocial functioning among 247 youths with intellectual disabilities and comorbid physical disabilities and/or psychiatric problems, recruited from a residential care institution and six special education schools in the Netherlands. Participants completed questionnaires about mindsets and perseverance, empowerment, mental health problems, and self-esteem. In order to measure mindsets and perseverance, a new instrument was developed based on existing mindset questionnaires for youth without intellectual disabilities (Dweck, 1999; Tamir et al., 2007). Because of the heterogeneity in this population, we explored differences within the group of youth with intellectual disabilities. Moreover, we examined differences between mindsets and perseverance in these youths with intellectual disabilities and 96 peers without intellectual disabilities attending education at a regular secondary school.
- **Chapter 3** explores the feasibility, intervention satisfaction, and effectiveness of the newly developed online mindset intervention The Growth Factory in a randomized controlled pilot study with four measurement moments. Participants were 59 youths with mild to borderline intellectual disabilities and/or mental health problems, recruited from a Dutch special education school. The first objective was to explore participants' satisfaction with the intervention using a quantitative and a qualitative approach. The second objective was to obtain preliminary insight into the effectiveness of The Growth Factory on mindsets and perseverance, empowerment, self-esteem, coping, and internalizing and externalizing problems.
- **Chapter 4** presents the study protocol of the randomized controlled trial studying the effectiveness of The Growth Factory for youth with mild to borderline intellectual disabilities and/or physical or psychiatric problems. In this chapter, the background, hypotheses, design, sample and recruitment, procedure, intervention The Growth Factory, outcome measures, and statistical analyses will be described.
- **Chapter 5** addresses the feasibility, participant satisfaction, and clinical effectiveness of The Growth Factory in a randomized controlled trial, using a sample of 119 youths with mild to borderline intellectual disabilities and comorbid physical and/or psychiatric problems, recruited from six special education schools and a residential care institution in the Netherlands. Participants were allocated to the intervention or control condition using a stratified block design to ensure equality between conditions.

Participants in the intervention condition ($n = 59$) participated individually in six sessions of The Growth Factory in addition to their usual care program. The participants in the control condition ($n = 60$) attended the school curriculum or usual care as recommended by their clinicians, regardless of this study. To test the effectiveness of The Growth Factory we asked youth in both groups to fill out pre-test, post-test, and 3 and 6 months follow-up questionnaires. Mindsets and perseverance were primary outcomes, whereas empowerment, mental health problems, self-esteem, treatment motivation, and therapeutic alliance were secondary outcomes. In addition, at the end of each session participants in the intervention condition graded their satisfaction with the intervention on quantitative and qualitative satisfaction measures.

- **Chapter 6** provides a more in-depth understanding for whom and why The Growth Factory works by investigating potential moderators and working mechanism of the online intervention. More specifically, we examined whether youth's baseline mindsets, gender, age, level of intellectual disability, and intervention satisfaction would serve as moderators. Moreover, we examined whether the effect of the intervention on mental health would (partially) run via improvements in perseverance.
- **Chapter 7** summarizes and reflects on the main findings of this dissertation. Strengths, limitations, clinical implications, and recommendations for future research will be discussed.

Chapter 2

Mindset and its association with psychosocial functioning in youth with intellectual disabilities

Published as:

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Abstract

Background

Mindset refers to the implicit assumptions about the malleability of attributes such as intelligence, behavior, and personality. Previous research has shown that people endorsing a growth mindset show better academic and mental health outcomes than those with a fixed mindset. However, little is known about the mindset of youth with intellectual disabilities (ID) and its association with mental health.

Methods

Adolescents with ($n = 247$) and without ($n = 96$) mild to borderline ID completed questionnaires about mindset and perseverance, empowerment, mental health problems, and self-esteem.

Results

Adolescents with ID endorse a more fixed mindset of emotion and behavior than adolescents without ID. No significant differences were found for mindset of intelligence and perseverance. In addition, within the group of youth with ID some differences in mindset and perseverance were found based on level of intellectual disability, gender, and comorbidities, but not for age. Finally, a growth mindset of emotion and behavior and perseverance, but not mindset of intelligence, were negatively related to mental health problems in youth with ID.

Conclusion and Implications

Overall, findings indicate that teaching youth with ID a growth mindset of emotion and behavior and perseverance may be a potentially successful endeavour to improve mental health in adolescents with ID.

What this paper adds

Previous research on mindset has mainly focused on youth without ID. The present study extends the current knowledge by investigating the mindset and perseverance of youth with ID and presents a detailed examination within this group. Moreover, this study is the first to investigate the relationship between mindset and perseverance and empowerment, mental health problems, and self-esteem among youth with ID. In addition, we provide an instrument to assess mindset and perseverance in adolescents with ID.

Introduction

Physical and mental health problems among youth with intellectual disabilities

Research has shown that youth with intellectual disabilities (ID) are a highly vulnerable population as they tend to have an increased risk of comorbid physical and mental health symptoms (Cooper et al., 2015; Dekker & Koot, 2003; Munir, 2016). The prevalence studies indicate that youth with ID are three to seven times more likely to show emotional (i.e., depression and anxiety) and behavioral (i.e., attention problems and aggressive behavior) problems and lower self-esteem than their peers without ID (e.g., De Ruiter, Dekker, Verhulst, & Koot, 2007; Dykens, 2000; Einfeld, Ellis, & Emerson, 2011; Valàs, 1999). In addition, youth with ID experience more difficulties and delays in academic, social and adaptive skills compared with non-ID youth. Moreover, it has been suggested that psychopathology causes greater impairment in everyday life for youth with ID than in the general population (Dekker & Koot, 2003).

Four factors have been identified that contribute to the high proportion of physical and mental health problems in youth with ID (Dykens, 2000). First, biological risk factors, such as brain damage or genetic abnormalities, are more prevalent in youth with ID and co-occur with mental illness (Crocker, Prokić, Morin, & Reyes, 2014; Goodman & Graham, 1996; State, King, & Dykens, 1997). Psychological factors, such as feelings of inferiority and incompetence due to frequently experienced failures, may also impinge on mental illness (Dykens, 2000). Third, social factors such as social rejection and/or stigmatization have been associated with mental health problems (Corrigan, Markowitz, Watson, Rowan, & Kubiak, 2003; Power, 2008; Scior & Werner, 2016). Finally, familial factors, such as overprotective care, and parental coping styles and maladjustments, also relate to mental health problems (Power, 2008; Reindl, Waltz, & Schippers, 2016).

All the mentioned risk factors may have a negative impact on the mindset defined as a collection of core assumptions about the malleability of personal abilities and traits of youth with ID. Research has shown that mindset can be either a protective or risk factor in the psychosocial development of youth (Schleider, Abel, & Weisz, 2015). For people with ID enhancing a growth mindset may be a promising approach to improve their mental health condition. However, studies on the mindset of youth with ID and its relationship with psychosocial outcomes are scarce.

Mindset theory

The concept of mindset refers to fundamental beliefs whether or not personal attributes, such as intelligence, emotion, and personality can change (Dweck, 1999). Two types of mindset can be distinguished: a fixed mindset and, on the other side of the spectrum, a growth mindset. People with a fixed mindset view their attributes as static and uncontrollable. In contrast, people with a growth mindset believe their qualities have the potential to change through effort and experience. Consequently, the extent to which people perceive their attributes as fixed or malleable set up different psychological processes that affect how they interpret and respond, and feel in various situati-

ons. According to Dweck's theory mindset should be regarded as domain-specific. This means that people can simultaneously hold a different mindset in different domains, e.g., someone may believe that personality is malleable but intelligence is fixed (Molden & Dweck, 2006).

A wide body of research has shown that a growth mindset contributes to more beneficial academic and psychosocial outcomes than a fixed mindset (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Blackwell, Trzesniewski, & Dweck, 2007; Robins & Pals, 2002; Schleider et al., 2015), however, at present little is known about the potential outcomes of a growth mindset for youth with ID. In our study we decided to explore the associations between mindset and perseverance with empowerment, mental health and self-esteem in youth with ID.

Relationship between mindset and perseverance, empowerment, mental health problems and self-esteem

Research has shown that one's mindset is related to an array of self-regulatory processes, henceforth referred to as perseverance. These processes are related to persons attributions and reactions to effort, failure, and challenge (Burnette et al., 2013; Mrazek et al., 2018; Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018). In particular, when people believe they are capable of change, they will be more eager to learn and practice and therefore embrace challenges as opportunities to grow (Dweck, 2006). In addition, failure will be attributed to a lack of effort instead of a lack of ability. Therefore, rather than feeling helpless to change their circumstances, people with a growth mindset will exert effort to improve their abilities, reverse setbacks and prevent or overcome aversive situations (Blackwell et al., 2007). More specifically, meta-analytic results on 113 studies ($N = 28.217$, age range 5–42 years) revealed that a more growth-oriented mindset of intelligence predicted effort beliefs, learning goals, and more optimistic expectations when evaluating the potential for future success (Burnette et al., 2013).

Mindsets can also be related to empowerment which can be defined as the experienced personal competence and perceived control to handle important matters (Bandura, 1994; Damen & Veerman, 2011; Zimmerman, 1995). Perceived control is a motivational construct that has been linked to both mindset and achievement goals (Doron, Stephan, Boiché, & Le Scanff, 2009; Dweck & Leggett, 1988; Leondari & Gialamas, 2002). Two previous studies showed that stronger growth mindsets of personal traits and ability were positively related with perceived control in adolescents (Doron et al., 2009; Schleider & Weisz, 2016b).

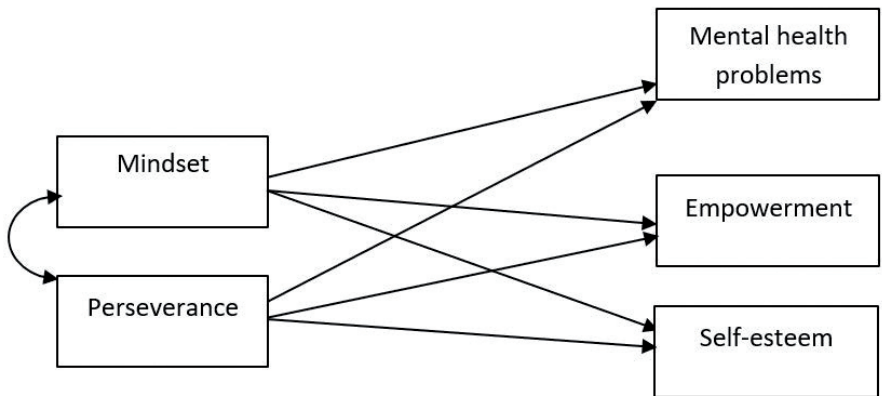
In addition, a growth mindset seems to buffer against psychological distress and protects youth from developing mental health problems. In two undergraduate samples ($n = 388$ and $n = 210$), students (aged 19–21 years) endorsing a growth-oriented mindset of anxiety and emotion reported fewer mental health problems (Schroder, Dawood, Yalch, Donnellan, & Moser, 2015). Similarly, a meta-analysis on 17 studies revealed that children with a fixed-oriented mindset were more likely to experience internalizing and externalizing problems compared to children with a growth-oriented mindset (Schlei-

der et al., 2015). Moreover, research has also shown that a fixed mindset predicts depression and well-being over time (Romero, Master, Paunesku, Dweck, & Gross, 2014; Tamir, John, Strivastava, & Gross, 2007). Finally, mindsets have also been related to self-esteem (De Castella et al., 2013; Robins & Pals, 2002). People with a growth mindset may be buffered against decrements in self-esteem because failure is not viewed as indicative of low ability but rather as useful feedback that inspires them to improve themselves (Robins & Pals, 2002). In particular, one longitudinal study examining 508 undergraduate students showed lower levels of self-esteem in students with a more fixed-oriented mindset and a steeper downward self-esteem trajectory compared to students with a growth-oriented mindset (Robins & Pals, 2002).

In sum, since youth with ID are more likely to struggle with mental health problems and self-esteem, these findings suggest that developing a growth mindset may serve as a protective factor which might buffer against mental health and self-esteem problems in this vulnerable population. See for a conceptual model, Figure 1.

Figure 1

Conceptual model



Mindset of youth with intellectual disabilities

Although Dweck’s mindset theory has become increasingly popular, most of the research concerning mindset focuses on adolescents without ID. However, it could be argued that adolescents with ID are more likely to endorse a fixed mindset than youth without ID. First, youth with ID are likely to be aware that they are intellectually disabled, and may interpret this as synonymous with having low intellectual potential (Baird, Scott, Dearing, & Hamill, 2009). Second, the construct of self-concept has been extensively studied among persons with ID (Maiano et al., 2019 for a review). These studies have indeed shown that youth with ID are at risk to have little confidence in themselves due to the increased likelihood to experience negative life events (e.g., parental separation, financial crisis, serious illness within the family) and repeated failures (Hatton & Emerson, 2004; Koestner, Aube, Ruttner, & Breed, 1995; Maiano et al., 2019). Subse-

quently, this might lead to the perception that one is unable to change aversive circumstances (Dweck, 1975). Finally, research suggests that youth struggling with emotional and psychiatric problems—which are more prevalent in youth with ID—experience these troubling thoughts, feelings, and behaviors as difficult or even impossible to change (Schleider & Weisz, 2016a; Tamir et al., 2007).

The few studies available show that children and youth with ID are more prone to developing a fixed mindset than typically developing peers. Children with ID often would blame failure to a lack of effort, rather than to a lack of ability (Koestner et al., 1995). In addition, youth with ID are more likely to endorse a fixed mindset, prefer goals aimed at demonstrating and proving ability instead of increasing ability, and show less perseverance (Baird et al., 2009). Although these studies focused on the mindset of intelligence, the examination of the mindset of emotion and behavior is of particular interest for our target group, given the specific impact of mindset of emotion and behavior on psychological and social functioning (Tamir et al., 2007).

Youth with ID should be considered a heterogeneous group of individuals. Therefore, it is of particular interest to examine differences in mindset within this vulnerable population. More specifically, we argue that within this group, it is important to differentiate between (1) youth with mild intellectual disability versus borderline intellectual functioning (BIF), (2) boys versus girls, (3) youth with physical disabilities versus psychiatric problems versus multiple comorbidities, and (4) early versus mid to late adolescents.

First, people with BIF, similar to people with ID, are at greater risk of mental health problems as compared to people without ID (Peña-Salazar, Arrufat, Santos, Novell, & Valdés-Stauber, 2018; Wieland, Kapitein-de Haan, & Zitman, 2014). Little attention has been paid to the population with BIF, even though special attention to this group may be warranted, as it is unknown whether mental health care services should be specifically tailored for people with BIF (Wieland et al., 2014). Research findings regarding mindset and its correlations with age and gender among youth with and without ID are mostly inconsistent (e.g., Baird et al., 2009; Koestner et al., 1995; Schleider & Weisz, 2016b; Tamir et al., 2007), calling for a closer examination of these constructs. Finally, research has shown that treatment rates for any mental illness are lower than for physical disabilities (e.g., Buist-Bouwman et al., 2006; Ormel et al., 2008), suggesting that youth with physical disabilities, psychiatric disorders, and multiple comorbidities might experience the malleability of their emotions, behaviors, and intelligence differently compared to one another. In the present study, we will examine differences in mindset in youth with ID exploratively regarding their intelligence level, age, gender, and problem type.

The present study

The first objective was to compare the mindset and perseverance of adolescents with and without ID. We hypothesized that youth with ID endorse a more fixed-oriented mindset of emotion and behavior and intelligence, and show less perseverance than peers without ID. The second objective was to exploratively examine differences in mindset and perseverance within the group of youth with ID, differentiating between

intelligence level, age, gender, and problem type. The final objective was to examine the associations between mindset and perseverance on the one hand, and empowerment, mental health problems, and self-esteem on the other hand within the group of youth with ID. We hypothesized that stronger endorsement of a growth mindset and higher levels of perseverance were related to higher levels of empowerment and self-esteem, and to lower levels of mental health problems.

Material and methods

Participants

The study included youth with and without ID. Participants with ID were recruited from a Dutch residential care institution and special education schools for youth with ID and comorbid physical disabilities and/or psychiatric problems. We considered an intellectual disability as a disorder that includes significant deficits in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills, with an onset before the age of 18 (Schalock, Luckasson, & Shogren, 2007). The group of youth with ID consisted of 247 adolescents (IQ 50–85). The majority of the participants was diagnosed with comorbid problems including a physical disability, a psychiatric disorder or both. To provide insight into the types of physical disabilities we used the online International Classification of Diseases (ICD-10, World Health Organization, 1992). The most common physical disabilities included diseases of the nervous system (42.1%), congenital malformations, deformations and chromosomal abnormalities (21.4%), and neurodevelopmental disorders (12.9%). Psychiatric diagnoses included autism (58.5%), attention deficit hyperactivity disorder (ADHD; 40.4%), attachment disorder (8.5%), oppositional defiant disorder (ODD; 7.4%), anxiety disorder (7.4%), and other (e.g., dysthemic disorder, post-traumatic stress disorder, Gilles de la Tourette; 8.5%). Notably, several participants were diagnosed with one or more psychiatric disorders. In the Netherlands, individuals with borderline intellectual functioning with severe limitations in adaptive functioning are also included in the healthcare and special education system for individuals with ID. Therefore, to examine mindset differences within the ID group, we differentiated between youth with mild ID (MID: IQ 50–69) and borderline intellectual functioning (BIF: IQ 70–85).

Participants without ID were 96 students at a regular Dutch secondary education school and attending education in the four-year vocationally-oriented stream (VMBO). Table 1 shows demographic characteristics of all participants.

Table 1
Demographic Characteristics of Youth With and Without Intellectual Disabilities

	ID (<i>n</i> = 247)		Mild ID (<i>n</i> = 139)		Borderline IF (<i>n</i> = 108)		No ID (<i>n</i> = 96)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender								
Male	157	63.6	86	61.9	71	65.7	54	56.3
Female	90	36.4	53	38.1	37	34.3	42	43.7
Age groups								
Early ad (<15 years)	106	42.9	57	41	49	45.4	54	56.3
Mid to late ad (>15 years)	141	57.1	82	59	59	54.6	42	43.7
Comorbidity								
Physical	141	59.7	85	64.9	56	53.3	-	-
Psychiatric	63	26.7	24	18.3	39	37.1	-	-
Multiple	32	13.6	22	16.8	10	9.5	-	-
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
TIQ	69	9.3	62	5.2	78	4.3	-	-
Age	15.5	1.8	15.6	1.92	15.3	1.7	14.7	1.4

Note. ID = intellectual disability; IF = intellectual functioning; ad = adolescence. TIQ = total intelligence quotient. Multiple comorbidity = one or more physical disabilities and psychiatric problems.

Procedure

Data collection took place in three phases between April 2014 and October 2017. Potential participants were initially selected by the treatment coordinator of the institute and the school psychologists. Inclusion criteria were youth between 12–23 years old with a mild to borderline intellectual disability (IQ 50–85; referral to special education or care). Besides an intellectual disability participants could have comorbid physical disabilities and/or psychiatric problems. Exclusion criteria were the presence of severe emotional problems hindering participation in the study, such as extreme aggression problems or an acute unstable mental condition. For all participants, information regarding gender, age, IQ scores, and diagnoses were provided by the coordinator or psychologists based on file information. For youth without ID, four classes of each of the four-year VMBO stream were selected to participate in this study by the school team leader.

After the selection process, detailed information about the study was sent to legal representatives of all the potential participants. Next, youth were informed by two research assistants in their classroom or group. If potential participants were absent or if they needed extra information, information was given individually at another time.

After obtaining informed consent from caregivers and youth, participants completed four questionnaires measuring mindset and perseverance, empowerment, mental health problems, and self-esteem. During the questionnaire assessment, the majority of youth with ID were guided by a trained research assistant in a quiet room. For youth without ID and a few classes of one special education school (with higher intelligence level), assessment took place in the classroom under guidance of two research assistants and the mentor teacher. Research assistants collected the data using a protocol. Participants completed the questionnaires on a computer and all participants were guaranteed anonymity.

Materials

Instruments were adjusted to reduce the complexity of the item content for participants using the Dutch guideline for developing, adjusting and conducting diagnostic instruments for people with ID (Douma, Moonen, Noordhof, & Ponsioen, 2012). As another means to reduce complexity, we unified the answering categories of the different questionnaires into one format ranging from 'completely untrue' to 'completely true', and coloured emoticons corresponding with the answering categories were added. Furthermore, we simplified or rephrased difficult words and sentences to better meet the needs of youth with ID and avoid misunderstandings due to literal interpretation. For an overview of the adapted items in Dutch, see Appendix A.

Mindset and Perseverance Questionnaire (MPQ)

To measure mindset and perseverance in adolescents with ID we developed the Mindset and Perseverance Questionnaire (MPQ) with Dweck's key mindset components as a theoretical starting point (Dweck, 2006). The MPQ measures adolescents' beliefs in the malleability of their emotions, behaviors and intelligence, and their perseverance in response to effort, challenges and setbacks. Information concerning the construction and factor loadings of the MPQ was presented in the Supplementary Materials. The MPQ consists of three subscales: 'mindset of emotion and behavior' (6 items), 'mindset of intelligence' (3 items), and 'perseverance' (9 items) with items scored on a five point Likert scale. All fixed mindset statements were reverse-scored such that higher scores indicate a growth mindset and higher levels of persistence. Cronbach's alphas for youth with and without ID were $\alpha = .64$ and $\alpha = .56$ for respectively mindset of emotion and behavior, $\alpha = .64$ and $\alpha = .60$ for mindset of intelligence, and $\alpha = .76$ and $\alpha = .83$ for perseverance.

Empowerment

Empowerment was measured with the Dutch Empowerment questionnaire youth 2.0 (EMPO Youth 2.0; Damen & Veerman, 1995). The EMPO 2.0 consists of two subscales 'intrapersonal' and 'interactional' empowerment with answering categories on a five-point Likert scale. Higher score indicates stronger feelings of empowerment. In the

present study only the subscale interactional empowerment (7 items) was used which is described as the alertness, willingness and resolve of an individual to change undesired situations by taking control and call upon resources (Damen et al., 2017). An example item of this subscale is 'I change things, when necessary'. Previous research indicates a satisfactory reliability for the subscale interactional empowerment (Damen & Veerman, 2011). In the present study Cronbach's alphas for youth with and without ID were respectively $\alpha = .65$ and $\alpha = .71$ if one item (i.e., 'I give up easily when things don't go my way') was deleted.

Mental health problems

Mental health problems were assessed using the Dutch version of the Brief Problem Monitor-Youth (BPM-Y; Achenbach, McConaughy, Ivanova, & Rescorla, 2011; Verhulst & Van der Ende, 2013). The BPM-Y contains nineteen items measuring internalizing problems (6 items, e.g., 'I feel unhappy, sad or depressed'), attention problems (6 items, e.g., 'I do not finish things that I start'), and externalizing problems (7 items, e.g., 'I threat other people') with three answering categories with higher scores indicating a higher level of problems. Previous research showed sufficient reliability (Achenbach et al., 2011). In the present study Cronbach's alphas for youth with and without ID were respectively $\alpha = .77$ and $\alpha = .86$ for internalizing problems, $\alpha = .73$ and $\alpha = .76$ for attention problems, $\alpha = .71$ and $\alpha = .58$ for externalizing problems, and $\alpha = .84$ and $\alpha = .81$ for the total problem scale.

Self-esteem

Self-esteem was measured using the Dutch Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Franck, De Raedt, Barbez, & Rosseel, 2008). The RSES is a ten item Likert scale with items answered on a four-point scale. An example item is 'I am satisfied with myself'. Higher score indicates a stronger sense of self-esteem. Previous research showed high internal consistency as well as high congruent validity (Franck et al., 2008). In the present study the scale showed reliability with Cronbach's alphas $\alpha = .83$ and $\alpha = .89$ for youth with and without ID, respectively.

Statistical analyses¹

To examine differences in mindset and perseverance between youth with and without ID and differences within the group of youth with ID (i.e., youth with MID versus BIF, boys versus girls, youth with physical disabilities versus psychiatric problems versus multiple comorbidities, and early versus mid to late adolescents), we performed independent-samples t-tests. Moreover, Cohen's *d* was derived in order to measure the effect sizes of the differences between groups, with the following intervals for *d*: values below 0.20: no effect; 0.20 to 0.50: small effect; 0.51 to 0.80: medium effect; and 0.81 or higher: large effect (Cohen, 1988). Furthermore, to explore the bivariate associati-

¹ Individuals with autism may understand certain concepts and statements differently than those without autism suggesting caution in the use of self-report measures with youth with ASD (e.g., Mazefsky, Kao, & Oswald, 2011). However, separate analyses—once without participants with an ASD diagnosis, and once with participants with ASD treated separately—showed similar results.

ons between youths' mindset and perseverance on the one hand and empowerment, mental health problems, and self-esteem on the other hand, we calculated Pearson correlations.

Results

Preliminary analyses

First, the distributions of the questionnaires measuring empowerment, mental health problems, and self-esteem were examined for outliers (Tabachnik & Fidell, 2007). For youth with ID, two outliers in the self-esteem questionnaire were identified and re-scored. As suggested by Tabachnik & Fidell (2007), we assigned the outlying cases a raw score that was one unit larger (or smaller) than the next most extreme score in the distribution to reduce their impact. No outliers were identified in the questionnaires for youth without ID. In addition, indicators for normality were all in the acceptable range.

Mindset and perseverance of youth with and without intellectual disabilities

The first objective of this study was to examine differences in mindset and perseverance between youth with and without ID. All the differences between the ID and non-ID group tested in the study were presented in Table 2. There were no significant differences between youth with and without ID in mindset of intelligence and perseverance ($p > .05$), but youth with ID significantly endorsed a more fixed-oriented mindset of emotion and behavior ($d = -0.41$). Similar results were found when comparing youth without ID to either youth with MID ($t(233) = 3.77, p < .001$) or youth with BIF ($t(202) = 2.32, p = .022$). Youth without ID endorsed a more growth-oriented mindset of emotion and behavior than youth with MID ($d = -0.50$) or BIF ($d = -0.33$). Thus, youth with ID were more likely to believe that their emotions and behaviors were fixed, but did not differ in their beliefs whether intelligence was fixed or malleable nor demonstrated different levels of perseverance compared to youth without ID.

Table 2

Means, Standard Deviations and Group Differences for Mindset and Perseverance, Empowerment, Mental Health Problems, and Self-esteem

Variable	MBID <i>n</i> = 246			Non-ID <i>n</i> = 96			<i>t</i>	<i>df</i>
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>		
Mindset and Perseverance								
Emotion Behavior	3.67	0.62	1.67–5.00	3.92	0.54	1.67–5.00	-3.43**	341
Intelligence	2.99	0.86	1.00–5.00	3.03	0.81	1.00–5.00	-0.38	341
Perseverance	3.77	0.58	2.11–5.00	3.78	0.57	2.11–5.00	-0.20	341
Empowerment	3.67	0.56	2.00–5.00	3.88	0.49	2.33–5.00	-0.32**	339
Mental health problems								
Internalizing	1.56	0.46	1.00–3.00	1.41	0.46	1.00–2.83	2.65**	341
Attention	1.75	0.47	1.00–3.00	1.68	0.44	1.00–2.67	1.32	341
Externalizing	1.45	0.37	1.00–2.57	1.31	0.28	1.00–2.00	3.81***	341
Total	1.58	0.34	1.00–2.63	1.46	0.28	1.00–2.21	3.09**	341
Self-esteem	3.01	0.47	1.70–4.00	3.13	0.49	1.70–4.00	-1.99*	340

Note. MBID = mild to borderline intellectual disabilities; * $p < .050$, ** $p < .010$, *** $p < .001$.

Differences in mindset and perseverance in the group of youth with intellectual disabilities

The second objective was to explore differences in mindset and perseverance in the heterogeneous population of youth with ID (see Table 3). Youth with MID endorsed a more fixed-oriented mindset of intelligence compared with youth with BIF ($d = 0.26$). There were no differences in mindset of emotion and behavior and perseverance between youth with MID and BIF. In addition, no differences were found between boys and girls regarding mindset of emotion and behavior and mindset of intelligence, although boys with ID reported higher levels of perseverance than girls with ID ($d = 0.31$).

Furthermore, no differences in mindset of emotion and behavior, mindset of intelligence, and perseverance were found between youth with ID and different types of co-occurring disabilities, with one exception. Youth with ID and multiple comorbidities (i.e., physical disabilities and psychiatric problems) endorsed a more fixed-oriented mindset of emotion and behavior compared to youth with ID and co-occurring physical disabilities ($d = 0.48$). Finally, no differences were found in mindset of emotion and behavior,

mindset of intelligence, and perseverance between early and mid to late adolescents with ID. Thus, youth with MID were more likely to view their intelligence as fixed compared to youth with BIF, boys reported stronger perseverance than girls, and youth with ID and multiple comorbidities were more likely to view their emotions and behaviors as unchangeable than youth with ID and co-occurring physical disabilities.

Table 3
Differences in Mindset and Perseverance within Youth with Intellectual Disabilities

	Mindset EB			Mindset Intelligence			Perseverance		
	<i>M</i>	<i>SD</i>	<i>t</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>M</i>	<i>SD</i>	<i>t</i>
ID level									
Mild ID	3.63	0.60		2.89	0.84		3.78	0.56	
BIF	3.73	0.64	-1.19	3.12	0.88	-2.06*	3.74	0.60	0.54
Gender									
Female	3.67	0.53		2.92	0.85		3.65	0.60	
Male	3.68	0.66	-0.15	3.03	0.87	-0.95	3.83	0.56	-2.34*
Comorbidity									
Physical	3.73	0.58		2.99	0.82		3.78	0.48	
Psychiatric	3.64	0.63	0.91	2.92	0.96	0.52	3.73	0.73	0.55
Comorbidity									
Physical	3.73	0.58		2.99	0.82		3.78	0.48	
Multiple	3.43	0.72	2.48*	3.00	0.79	-0.05	3.76	0.51	0.23
Comorbidity									
Psychiatric	3.64	0.63		2.92	0.96		3.73	0.73	
Multiple	3.43	0.72	1.45	3.00	0.79	-0.39	3.76	0.51	-0.21
Age									
Early ad	3.67	0.65	-0.13	2.97	0.92	-0.25	3.79	0.60	0.51
Mid-late ad	3.68	0.60		3.00	0.81		3.75	0.56	

Note. EB = emotion and behavior; BIF = borderline intellectual functioning; ad = adolescence; **p* < .050.

Relationship between mindset and perseverance, empowerment, mental health problems and self-esteem in youth with intellectual disabilities

The third objective in this study was to investigate the relationship between mindset and perseverance, and empowerment, mental health problems, and self-esteem in youth with ID (see Table 4). Small positive correlations were found between mindset of emotion and behavior and empowerment and self-esteem, indicating that stronger endorsement of a growth mindset of emotion and behavior is related to higher levels of empowerment and self-esteem. In addition, significant negative correlations were found between mindset of emotion and behavior and mental health problems (i.e., internalizing, attention, externalizing, and total problems), indicating that higher levels of a growth mindset of emotion and behavior are related to lower levels of mental health problems. Second, mindset of intelligence was not significantly correlated with empowerment, mental health problems and self-esteem. Third, we found significant positive correlations between perseverance and empowerment and self-esteem, and significant negative correlations between perseverance and mental health problems. Thus, in youth with ID a growth mindset of emotion and behavior and perseverance are positively *associated* with empowerment and self-esteem and negatively *associated* with mental health problems, but no relationship was found between a growth mindset of intelligence and empowerment, self-esteem, and mental health problems.

Additional analyses

Additional analyses showed that youth with ID reported lower levels of empowerment ($d = 0.38$) and self-esteem ($d = -0.24$) than youth without ID, whereas youth with ID reported higher levels of internalizing ($d = 0.32$), externalizing ($d = 0.41$), and total mental health problems ($d = 0.37$). There were no significant differences between youth with and without ID regarding attention problems ($p > .05$).

Table 4

Correlations for Mindset and Perseverance, Empowerment, Mental Health Problems, and Self-Esteem in Youth With Intellectual Disabilities

		Correlations								
Variable	1	2	3	4	5	6	7	8	9	
Mindset and Perseverance										
1. Emotion/Behavior	-									
2. Intelligence	.36	-								
	.23***									
3. Perseverance	.39	.22	-							
	.27***	.15*								
Empowerment										
4. Empowerment	.37	-.00	.40	-						
	.24***	-.00	.28***							
Mental health problems										
5. Internalizing	-.33	.08	-.31	-.22	-					
	-.23***	.06	-.24***	-.16*						
6. Attention	-.20	-.10	-.49	-.20	.53	-				
	-.13*	-.07	-.36***	-.14*	.40***					
7. Externalizing	-.27	-.12	-.33	-.15	.55	.73	-			
	-.18**	-.08	-.24***	-.10	.41***	.53***				
8. Total	-.31	-.05	-.44	-.23	.94	1.00	1.00	-		
	-.23***	-.04	-.36***	-.17**	.76***	.81***	.80			
Self-esteem										
9. Self-esteem	.39	-.07	.39	.49	-.76	-.33	.43	.60	-	
	.28***	-.05	.31***	.36***	-.61**	-.26***	-.33**	-.50***		

Note. * $p < .050$, ** $p < .010$; *** $p < .001$. Values in italics = correlation corrected for attenuation.

Discussion

The results obtained in our study showed that youth with mild or borderline ID endorse a more fixed mindset of emotion and behavior than peers without ID, whereas no significant differences were found in the endorsement of a fixed mindset of intelligence and in perseverance. Although some mindset and perseverance differences were found within the ID group, results indicate that mindset and perseverance are more or less similar when taking intellectual disability, gender, comorbidities, and age differences into account. Finally, results showed that like typically developing youth, a growth mindset of emotion and behavior and higher levels of perseverance are associated with stronger feelings of empowerment and self-esteem, as well as with lower levels of internalizing, attention, externalizing, and total mental health problems (e.g., Doron et al., 2009; Robins & Pals, 2002; Schleider et al., 2015). No significant associations were found between endorsing a growth mindset of intelligence and these three psychosocial variables among youth with ID.

The fact that youth with ID seem more likely to hold a fixed mindset about their emotions and behaviors compared to peers without ID may be explained in line with presumptions of Tamir and colleagues (2007) and Schleider and Weisz (2016a) who suggest that individuals with more intense emotional experiences, such as youth with ID, are more likely to develop a fixed mindset, as they probably experience troubling feelings and behaviors as very difficult or even impossible to change. Previous research indicated that youth with ID experience more negative life events and experience daily stressors as more impactful compared to peers without ID (Bramston, Fogarty, & Cummins, 1999; Hatton & Emerson, 2004).

Interestingly, unlike previous research (Baird et al., 2009; Koestner et al., 1995), we did not find differences in mindset of intelligence and perseverance between youth with and without ID. Several explanations come to mind for the absence of these differences between youth with and without ID. First, youth with ID in our sample were recruited from special education schools instead of regular classrooms. This context might have decreased the risk of being exposed to overly demanding cognitive tasks (Gacek, Smolén, & Pilecka, 2017) as well as the awareness of being identified as *intellectually* disabled which may have resulted in a higher academic self-concept among youth with ID (Szumski & Karwowski, 2015). In contrast, youth without ID in our sample attending education in the lowest ability stream (VMBO) in their secondary school may have suffered more from processes of social comparison, potentially negatively impacting their self-esteem, self-efficacy, and academic self-concept (Ireson, Hallam, & Plewis, 2001; Oakes, 1985; Szumski & Karwowski, 2015). Consequently, the perception of a limit on their intelligence might have been more evident in youth without ID compared to youth with ID in our sample, further reducing a possible difference in mindset between both groups. Moreover, differences in the measurement of a mindset of intelligence may account for the different findings in our study and previous research. For example, in the current study, three first-person fixed statements (i.e., personal intelligence as unchangeable) were used for measuring mindset of intelligence, whereas Koestner and

colleagues (1995) interpreted the results on an eight items questionnaire assessing participants attributional style for failure as evidence for this concept.

In addition to examining differences between youth with and without ID, we also examined possible differences in mindset and perseverance in the population of youth with ID. Our findings show that youth with mild ID are more likely to hold a fixed mindset of intelligence than youth with borderline intellectual functioning. This could be explained by the fact that, in the Netherlands, youth with ID are encouraged to attend internships in regular settings and transfer to mainstream education (Van Leeuwen, Thijs, & Zandbergen, 2009). However, due to their lower general intelligence, youth with mild ID may be less likely to access these regular settings and therefore, might be more likely to adopt a fixed view about the malleability of their intelligence. Notably, in line with previous studies among youth without ID (e.g., Dweck, Goetz, & Strauss, 1980), boys with ID reported higher levels of perseverance than intellectual disabled girls. This could be explained by the contrasting experiences boys and girls have with praise and feedback (Dweck et al., 1980; Gunderson et al., 2018). For example, teachers attribute boys' failures to a lack of motivation more often than they do for girls and therefore, boys are more likely to blame their effort instead of their ability (Dweck et al., 1980). Another interesting finding was that youth with ID and multiple comorbidities were more likely to report a fixed mindset of emotion and behavior compared to youth with ID and only co-occurring physical disabilities. This could be explained by the strong relationship between psychiatric disorders and mental health problems in youth with ID (e.g., Myrbakk & von Tetzchner, 2008). As youths with more intense emotional experiences are more likely to experience difficulty in altering their troubling feelings and behaviors (Schleider & Weisz, 2016a; Tamir et al., 2007), it seems likely that youth with ID and multiple comorbidities are more likely to develop a fixed mindset of emotion and behavior.

Finally, although previous studies have demonstrated support for the hypothesis that mindset of intelligence predicts mental health outcomes among youth without ID (e.g., Doron et al., 2009; Schleider & Weisz, 2016b), the current study did not find an association between mindset of intelligence and psychosocial outcomes (i.e., empowerment, mental health problems, self-esteem) in youth with ID. This may be explained by findings of a recently published meta-analysis (Schleider et al., 2015) showing that positive associations between a fixed mindset and mental health problems are stronger—though not significant—for a fixed mindset of personality than for a fixed mindset of intelligence.

There are several limitations in this study that should be mentioned. First, given the cross-sectional design, caution is warranted for any statements about causality. Longitudinal data would allow for the test of different alternative conceptual models. For instance, it is possible that in a mediation model, mindset is the construct that sets in motion elevated levels of perseverance, which in turn affects empowerment, mental health problems, and self-esteem. Second, we assessed mindset of emotion and behavior, mindset of intelligence, and perseverance with the newly developed Mindset and Perseverance Questionnaire. Some of the subscales suffered from modest internal re-

liabilities and therefore, caution is needed when interpreting the results. Future research should replicate EFA using larger youth samples with ID to confirm the psychometric properties of this questionnaire. Third, it is important to recognize that findings in the present study are based on participants self-reports. Although research on mindset is dominated by self-report measures (e.g., De Castella & Byrne, 2015; Schroder et al., 2015), future research should include multiple informants and behavioral tasks. Notwithstanding these limitations, the current study adds new information to the literature in different ways. First, we expanded on previous studies by examining differences in mindset and perseverance between youth with and without ID and within youth with ID. The present study included a large sample of youth with ID. Furthermore, while existing mindset research has been domain-specific, with studies focusing either on intelligence (e.g., Blackwell et al., 2007) or on emotion (e.g., De Castella et al., 2013), we examined both mindset of emotion and behavior and mindset of intelligence in the same study. This is important because people can hold a different mindset in different domains and one's mindset in a given domain predicts different, but equally important outcomes (Molden & Dweck, 2006; Romero et al., 2014).

In conclusion, the present study demonstrates that youth with ID are more likely than their peers without ID to hold a fixed mindset of emotion and behavior. The associations between the mindset and perseverance and psychosocial outcomes (i.e., empowerment, mental health problems, and self-esteem) in youth with ID are similar to those known from previous research on peers without ID. This suggests that implementation of mindset interventions tailored for youth with ID may be a potentially successful endeavor contributing to feelings of control, self-confidence and improved mental health in youth with ID.

Appendix A

Original and Rephrased Items for the Empowerment, Mental Health, and Self-Esteem Questionnaires

Measures	Original item (English)	Original item (Dutch version)	Rephrased item (in Dutch)
EMPO 2.0			
1.		Ik grijp direct in als er problemen zijn.	Ik doe meteen iets als er problemen zijn.
2.		Ik leg me niet snel bij de gang van zaken neer.	Ik geef snel op als het niet gaat zoals ik wil.
3.		Ik ben zeer goed in staat om voor mijn eigen belangen op te komen.	Ik kan goed opkomen voor mezelf.
6.		Ik vecht altijd voor zaken die ik echt belangrijk vind.	Ik zet me in voor dingen die ik echt belangrijk vind.
7.		Ik maak gebruik van raad of steun uit mijn omgeving, als dat nodig is.	Ik maak gebruik van advies, als dat nodig is.
BPM-Y			
4.	I have trouble concentrating or paying attention.	Ik vind het moeilijk om me te concentreren of om mijn aandacht ergens bij te houden.	Ik vind het moeilijk om mijn aandacht ergens bij te houden.
17.	I threaten to hurt people.	Ik dreig mensen hen pijn te doen.	Ik dreig mensen pijn te doen.
RSES			
1.	On the whole, I am satisfied with myself.	Over het algemeen genomen ben ik tevreden met mezelf.	Ik ben tevreden met mezelf.
3.	I feel that I have a number of good qualities.	Ik heb het gevoel dat ik een aantal goede eigenschappen heb.	Ik heb een aantal goede eigenschappen.
5.	I feel I do not have much to be proud of.	Ik heb het gevoel dat ik niet veel heb om trots op te zijn.	Ik heb veel om trots op te zijn.
6.	I certainly feel useless at times.	Soms voel ik mij beslist nutteloos.	Soms voel ik mij echt nutteloos.
7.	I feel that I'm a person of worth, at least on an equal plane with others.	Ik heb het gevoel dat ik een persoon ben die wat waard is, op zijn minst evenveel als anderen.	Ik ben net zoveel waard als anderen.

8.	I wish I could have more respect for myself.	Ik wou dat ik wat meer respect voor mezelf kon hebben.	Ik zou meer respect voor mezelf willen hebben.
9.	All in all, I am inclined to feel that I am a failure.	Al met al voel ik me nogal een mislukking.	Ik voel me nogal een mislukking.
10.	I take a positive attitude toward myself.	Ik sta positief ten opzichte van mezelf.	Ik ben positief over mezelf.

Appendix B

Mindset and Perseverance Questionnaire

1.	I can learn to control how I feel.
2.	I will never learn to control how I feel.
3.	I control my behavior.
4.	I can learn to control how I behave.
5.	I can't really change of how I behave.
6.	I will never learn to control how I behave.
7.	How smart I am is sort of fixed.
8.	I can learn something new, but how smart I am is fixed.
9.	I can't really change how smart I am.
10.	Practising a lot is useless.
11.	By practising a lot I will get better.
12.	Practising a lot means I am learning something.
13.	If something is hard, I try even harder.
14.	If something does not work, I quit.
15.	If something does not work, keep practising is useless.
16.	If something does not work, I keep going.
17.	I prefer tasks which make me think hard.
18.	I prefer tasks that I can learn from, even if I make a lot of mistakes.

Supplementary Materials

Mindset and Perseverance Questionnaire

To measure mindset and perseverance in adolescents with ID we developed the Mindset and Perseverance Questionnaire (MPQ) with Dweck's key mindset components as a theoretical starting point (Dweck, 2006). Initially, the MPQ contained 26 items and consisted of two parts. Part one measured mindset with three subscales (1) Emotions, (2) Behaviors, and (3) Intelligence. Part two consisted of self-regulatory behaviors with three subscales (4) Effort, (5) Failure, and (6) Challenge. The subscale intelligence was drawn from the Implicit Theories of Intelligence Scale for Children (Dweck, 1999) and the subscale emotions was based on the scale of Implicit Theories of Emotions (Tamir et al., 2007). Each subscale consisted of four items and assessed both growth and fixed mindset, with exception of the subscale intelligence consisting of six items. The participants were asked to rate their agreement with each statement on a five point Likert scale ranging from 1 (completely untrue) to 5 (completely true). All fixed belief statements were reverse-scored such that higher scores indicate greater endorsement of a growth mindset and more perseverance.

To assess the factor structure of the MPQ we used exploratory factor analysis (EFA) among the participants with ID with the program package FACTOR v.8.10, suitable for studies with small sample sizes (Lorenzo-Seva & Ferrando, 2006). Parallel analysis is considered to be one of the best methods for determining the number of factors to be retained (Hayton, Allen, & Scarpello, 2004; Lorenzo-Seva & Ferrando, 2006). Therefore, without affecting the theoretical integrity of the data, we conducted parallel analyses (Horn, 1965) with unweighted least squares (ULS) estimation and normalized varimax rotation for each part of the initial questionnaire.

Based on new scientific insights (De Castella & Byrne, 2015), three items of the intelligence subscale formulated in terms of a second-person claim were deleted from the MPQ. The recent study showed that beliefs about *personal ability* to improve intelligence are distinct from beliefs about the malleability of intelligence *in general* (De Castella & Byrne, 2015). The final item set of the MPQ reflected only first-person claim about the extent to which mindset was fixed or malleable.

In evaluating the fit of the models, the likelihood ratio Chi-square (χ^2) statistic and goodness-of-fit index (GFI) were examined. The fit of the first model (i.e., mindsets) was $\chi^2(34) = 115.38, p < .001$, and GFI = .97. For the three subscales of the first part of the MPQ, the EFA suggested a two-factor structure. All four 'behavior' items and two 'emotion' items loaded onto the first factor, and all three 'intelligence' items loaded onto the second factor at .40 or higher. In addition, one 'behavior' item cross-loaded low onto the intelligence factor and was therefore retained for the first factor. The fit of the second model (i.e., self-regulation) was $\chi^2(54) = 253.95, p < .001$, and GFI = .94. For the three subscales from the second part of the MPQ, the EFA suggested a single-factor structure. All items with loadings of .40 or higher were retained for this factor structure, therefore three items were eliminated. We captured this single factor representing

items focused on self-regulatory processes in terms of attributions and reactions to effort, failure, and challenge with the term 'perseverance'. Factor loadings are presented in Table 5. After parallel analyses, the final MPQ consists of 18 items divided over three subscales, that is 'mindset of emotion and behavior' (6 items), 'mindset of intelligence' (3 items), and 'perseverance' (9 items). All items of the final MPQ subscales and factor loadings from the unrotated loading matrix are presented in Appendix B.

Before possessing the internal consistency of the MPQ subscales in SPSS using Cronbach's alpha, we identified outliers using Z-values in excess of 3.29 ($p < .001$, two-tailed test; Tabachnik & Fidell, 2007). Three outliers were detected (i.e., two outliers in the subscale 'mindset of emotion and behavior' and one outlier in 'perseverance'). As suggested by Tabachnik & Fidell (2007), we assigned the outlying cases a raw score that was one unit larger (or smaller) than the next most extreme score in the distribution to reduce their impact. In the present study the value of Cronbach's alpha for mindset of emotion and behavior, mindset of intelligence, and perseverance for youth with ID was $\alpha = .64$, $\alpha = .64$, and $\alpha = .76$, respectively. In addition, congruent with previous research (Blackwell et al., 2007; Schleider & Weisz, 2016a), the subscales significantly positively correlated with one another (ranging from $r = .15$ to $.27$, $p < .05$ and $p < .001$) for youth with ID, suggesting moderate, significant associations between the constructs (Table 4). The overall conclusion is that the construct validity and reliabilities of the MPQ subscales ranged from sufficient to satisfactory and that the questionnaire was suitable for youth with ID. For youth without ID Cronbach's alpha demonstrated $\alpha = .56$, $\alpha = .60$ and $\alpha = .83$ for the mindset of emotion and behavior, mindset of intelligence, and perseverance subscales, respectively.

Table 5
Factor Loadings for Exploratory Factor Analysis of the Mindset Questionnaire

		Factor	
		1	2
First model 'Mindset'			
Mindset of emotion and behavior			
1.	I can learn to control how I feel.	.415	.153
R2.	I will never learn to control how I feel.	.512	.091
3.	I control my behavior.	.506	-.024
4.	I can learn to control how I behave.	.526	.186
R5.	I can't really change of how I behave.	.439	.365
R6.	I will never learn to control how I behave.	.546	.224
Mindset of intelligence			
R7.	How smart I am is sort of fixed.	-.055	.690
R8.	I can learn something new, but how smart I am is fixed.	.046	.600
R9.	I can't really change how smart I am.	.255	.573
Second model 'Perseverance'			
10.	Practising a lot is useless.	.523	
11.	By practising a lot I will get better.	.600	
12.	Practising a lot means I am learning something.	.547	
13.	If something is hard, I try even harder.	.559	
R14.	If something does not work, I quit.	.437	
R15.	If something does not work, keep practising is useless.	.634	
16.	If something does not work, I keep going.	.660	
17.	I prefer tasks which make me think hard.	.480	
18.	I prefer tasks that I can learn from, even if I make a lot of mistakes.	.594	

Note. Fit of the first model ($n = 246$, $\chi^2(34) = 115.38$, $p < .001$, $GFI = .97$) and second model ($n = 246$, $\chi^2(54) = 253.95$, $p < .001$, $GFI = .94$). R specifies that the scoring of the item is reversed.

Chapter 3

Online mindset intervention The Growth Factory: Pilot study

3

Submitted as:

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Abstract

Background

Mindset interventions have shown to stimulate academic, socio-emotional and behavioral development in youth in general, but mindset interventions for youth with special needs (intellectual disabilities and/or mental health problems) are lacking. This study explores the feasibility, intervention satisfaction, and effectiveness of The Growth Factory (TGF), a newly developed online mindset intervention for youth with ID in a special education setting using a RCT design.

Method

Youth with mild to borderline ID (IQ 50–85; 83%) and/or mental health problems ($N = 59$; 12–18 years) were randomly assigned to TGF ($n = 30$) or control group ($n = 29$). Primary outcomes were mindset of intelligence and mindset of emotion and behavior. Secondary outcomes were empowerment, coping, self-esteem, and internalizing and externalizing problems. Measurements were conducted at pre-test, post-test, and at 3 and 6 months follow-up.

Results

The implementation of the online mindset intervention TGF in a special education setting was feasible and TGF was positively evaluated by the majority of the participants. TGF was effective in improving mindset of intelligence at short-term and in improving empowerment at short to mid-term. No other effects were found.

Conclusion

Findings provided some preliminary evidence that TGF is a promising new intervention for youth with special needs in special education. Pilot findings were used to make some important changes to further improve TGF. The new version of TGF will be tested on effectiveness in a full-scale randomized controlled trial.

Introduction

Many youth with special needs (i.e., intellectual disabilities and/or mental health problems) have experienced difficulties in their personal development, educational and care trajectories. Amongst other factors, these experiences can have negatively influenced their implicit theories, or so-called mindset, on the malleability of their personal attributes (Dweck et al., 1995). According to the implicit theories model people endorsing a growth mindset (i.e., incremental theory) believe that their attributes are relatively malleable while people with a fixed mindset (i.e., entity theory) perceive their attributes to be fixed (Dweck et al., 1995). Research has shown that one's mindset is related to both academic outcomes as well as social-emotional and behavioral outcomes (e.g., Blackwell et al., 2007; for meta-analytic reviews Burnette et al., 2013; Schleider et al., 2015). Interventions teaching a growth mindset—so-called mindset interventions—aim to positively impact these outcomes (e.g., Blackwell et al., 2007; Miu & Yeager, 2015; Yeager et al., 2013). Hence, mindset interventions could contribute to a more optimal development of youth with special needs, but research into mindset interventions for this at-risk population is lacking. Therefore, we developed the online mindset intervention 'The Growth Factory' (TGF) specifically developed for youth with ID. In this study, we will test the mindset intervention TGF in a pilot study using a randomized controlled trial examining participants' satisfaction with the intervention, and provide preliminary insight into the effectiveness of TGF on youth's mindsets, empowerment, self-esteem, coping, and internalizing and externalizing problems.

Mindset

One's mindsets about human attributes influence the way people interpret and respond to reality (Dweck et al., 1995). According to Dweck et al. (1995) mindsets refer to two core assumptions (fixed vs growth) about the malleability of attributes in various domains such as intelligence, morality, personality, emotions and behaviors. People holding a fixed mindset believe that attributes are static (Dweck et al., 1995). They interpret outcomes as unchangeable being the result of fixed attributes, for example 'I failed because I am dumb'. People endorsing a growth mindset believe that attributes are more malleable, dynamic and developable (Dweck et al., 1995). They tend to interpret outcomes as the result of malleable attributes, which in turn makes the outcomes more changeable, for instance 'I failed because I did not put in enough effort'.

The mindset model has become increasingly popular in research to better understand and intervene upon academic, socio-emotional and behavioral outcomes. A large body of research demonstrated that mindsets are related to a wide range of outcomes in the academic domain. Research showed that a growth mindset is related to higher levels of self-efficacy (e.g., Diseth et al., 2014; Komaraju & Nadler, 2013), motivation (e.g., Haimovitz et al., 2011), self-regulation (e.g., Burnette et al., 2013) and academic achievement (e.g., Blackwell et al., 2007; McCutchen et al., 2016; Stipek & Gralinski, 1996). For instance, a longitudinal study showed that students with a growth mindset obtained better grades and test scores over time in comparison to students with a fixed mindset (Blackwell et al., 2007; McCutchen et al., 2016).

A new line of research focuses on the relationship between mindsets and mental health outcomes. A recent meta-analysis on children and adolescents showed an overall small effect size ($d = .25$) between mindset and mental health problems (Schleider et al., 2015). In addition, longitudinal research on mindsets showed that mindset of emotions predicted levels of depression and well-being over time and mindset of intelligence predicted self-esteem over time (Robins, & Pals, 2002; Romero et al., 2014; Tamir et al., 2007) and mindsets have also been related to aggression in response to victimization and exclusion (Yeager et al., 2013). In sum, youth endorsing a fixed mindset are more likely to experience internalizing and externalizing problems than their peers endorsing a growth mindset (Schleider et al., 2015). This relationship between mindset and mental health problems might be mediated by coping (De Castella et al., 2013). Research has demonstrated that growth mindsets are related to adaptive coping style which in turn was related to less internalizing and externalizing problems in adolescents (Rosenberg et al., 2016).

Research on mindsets in youth with special needs is very scarce, but the available research does suggest that youth with ID are more likely to endorse a fixed mindset than non-disabled peers (Baird et al., 2009; Koestner et al., 1995; Schleider et al., 2015; Verberg et al., 2019). In all, endorsing a growth mindset may stimulate the academic, socio-emotional and behavioral outcomes in youth.

Mindset interventions

Mindset interventions are brief psychological interventions that convey messages about the malleability of personal attributes, such as intelligence, personality, emotions or behaviors (Yeager & Dweck, 2012; Yeager & Walton, 2011). Mindset interventions aim to stimulate a growth mindset and thereby positively impacting academic, socio-emotional and behavioral outcomes (Yeager & Dweck, 2012). In the academic domain a six session mindset intervention improved students' growth mindset of intelligence and math achievements (Blackwell et al., 2007). Furthermore in the social-emotional and behavioral domain, youth receiving a six session mindset intervention improved a growth mindset of personality and pro-social behavior, and reduced aggression and conduct problems (Yeager et al., 2013). Another study showed that even a single session mindset intervention was effective in preventing increases in depressive symptoms in youth (Miu & Yeager, 2015).

Furthermore, mindset interventions also seem to be effective in clinical youth samples. A single session mindset intervention—conveying a message about the malleability of abilities—significantly increased a growth mindset of ability and cognitive performance, and reduced state anxiety in a clinical youth sample with anxiety and conduct problems (Da Fonseca et al., 2008, 2010). In addition, another study showed that a single session mindset intervention—focused on the malleability of personality—resulted in improvements in growth mindset of personality, perceived control (an aspect of empowerment), and stress recovery in a clinically internalizing youth sample (Schleider & Weisz, 2016b). Furthermore, research showed that a growth mindset manipulation had a positive impact on the challenge seeking and interest-enjoyment in a task in children

with ID (Koestner et al., 1995). Finally, a mindset intervention for residential youth with conduct problems showed significant increases in positive emotions, problem recognition, amenability to treatment, and reductions in psychopathic traits (Salekin et al., 2012). In conclusion, stimulating growth mindsets through mindset interventions might positively impact youth's academic, socio-emotional, and behavioral development in general and might be especially highly relevant for youth with ID and/or mental health problems as they are more likely to endorse fixed mindsets and to encounter academic, socio-emotional and behavioral problems. However, till so far research studying the potential of mindset intervention for this at-risk population is lacking.

The present study

The aim of the present study was to conduct a randomized controlled pilot study on the online mindset intervention The Growth Factory (TGF) with youth with ID and/or mental health problems in a special education setting. The first objective was to explore participants' satisfaction with the intervention using a quantitative and a qualitative approach. The second objective was to obtain preliminary insight into the effectiveness of the intervention on mindsets (i.e., mindset of intelligence and mindset of emotion and behavior), empowerment, self-esteem, coping, and internalizing and externalizing problems. We hypothesized that the intervention group would show larger increases in growth mindsets, empowerment, self-esteem, and adaptive coping, and larger decreases in maladaptive coping and internalizing and externalizing problems in comparison with a control group.

Method

Sample

Participants were recruited from a Dutch special education school. The sample consisted of $N = 59$ youth with $n = 30$ youth in the intervention group and $n = 29$ in the control group (see Figure 1 for a flow-diagram). The participants had an mean age of 14.53 ($SD = 1.58$; range 12–18) and the sample consisted of 46 boys (78%) and 13 girls (22%). School provided information regarding participants' IQ scores and mental health problems. The sample had a mean total IQ (TIQ) of 75.83 ($SD = 10.10$; range 60–103). In the sample 34% had a mild ID (TIQ 50–69), 52% had a borderline ID (TIQ 70–85) and 14% had no ID (TIQ > 85). The following mental health problems were most prevalent in the sample: ASS (71.2%), ADHD (40.7%), and ODD (13.6%). Other less prevalent problems were communication disorder (5.1%), anxiety disorder (5.1%), attachment problems (3.4%), mood disorder (1.7%), learning disorder (1.7%), Tourette's disorder (1.7%). The majority of youth (66%) had a combination of different mental health problems and/or an ID.

There were no significant differences between the intervention and control group with respect to age, TIQ, and gender distribution (all $p > .05$). In addition, there were no significant differences on the pre-test levels of the intervention outcomes mindset of intelligence, mindset of emotion and behavior, adaptive coping, maladaptive coping,

self-esteem, internalizing problems, and externalizing problems, respectively (all $p > .05$). We did, however, find a significant difference in pre-test levels of empowerment ($F(1, 57) = 5.992, p = .02$). The intervention group ($M = 3.55, SD = .51$) had significantly lower levels of empowerment at pre-test compared with the control group ($M = 3.87, SD = .51$).

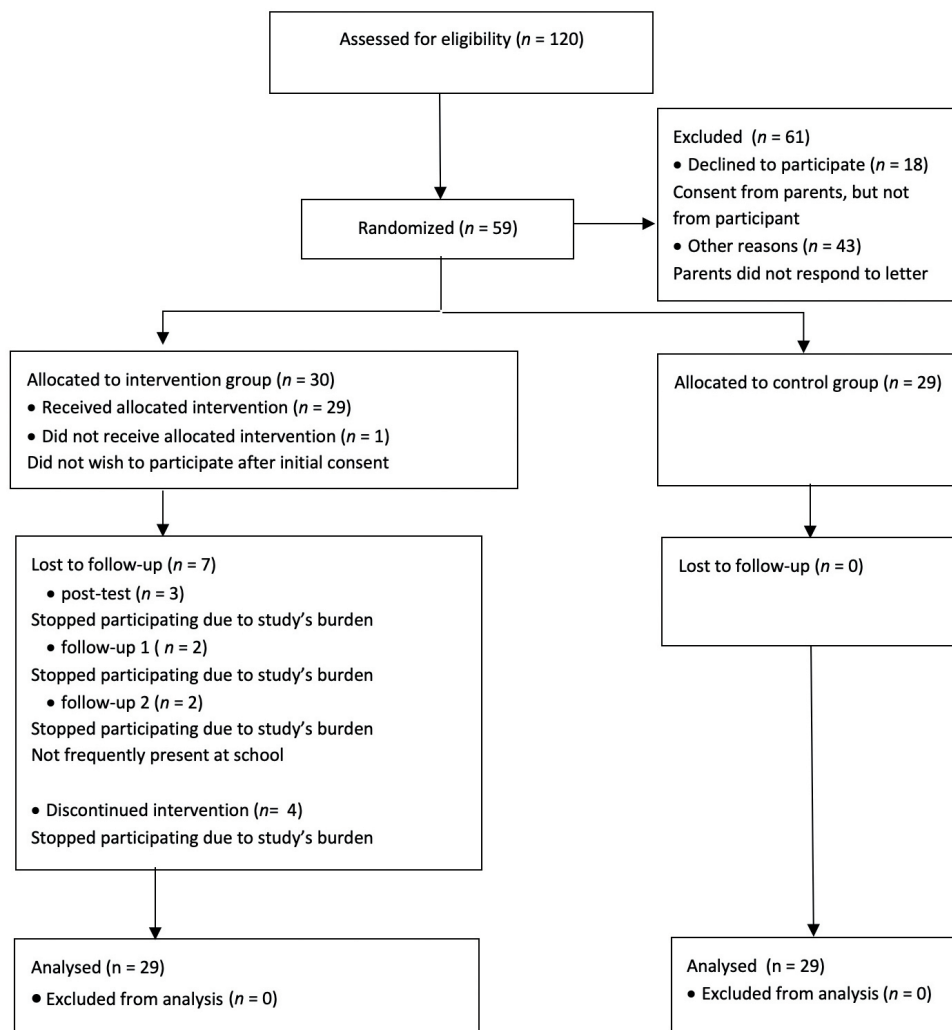
A few participants dropped out of the study; $N = 59$ completed the pre-test; $N = 55$ the post-test; $N = 53$ follow-up one, and $N = 51$ follow-up two. There were no differences in completers (four measurements) and dropouts (less than four measurements) with respect to age, TIQ, gender distribution, and pre-test scores levels of the intervention outcomes mindset of intelligence, mindset of emotion and behavior, empowerment, adaptive coping, maladaptive coping, self-esteem, and internalizing problems (all $p > .05$). However, we did find a significant difference between completers and dropouts in distribution of intervention group ($\chi^2(1) = 10.27, p = .001$) and pre-test score of externalizing problems ($F(1, 57) = 6.082, p = .02$). Dropouts were all part of the intervention group and dropouts scored significantly higher at pre-test levels of externalizing behavior ($M = 1.68, SD = .30$) compared with completers ($M = 1.36, SD = .37$).

Procedure

The study was approved by the Ethical Committee by the University of Amsterdam (2014-CDE-3752) and the trial was registered in Netherlands Trial Registration (NTR4803). Information regarding the research project was communicated by the school in their monthly bulletin and parents and youth were informed through an information letter which explained the purpose and design of the study. In addition, youth were also informed by their mentors about the project. Youth were included in the study if they met inclusion criteria and when both youth and parents provided informed consent. Inclusion criteria were being between 12 and 18 years old. Exclusion criteria were extreme aggression problems or an acute unstable mental condition hindering participation in the study. The school psychologist screened all students for eligibility to participate in the study. We used a RCT to study the effectiveness of TGF using four measurement points (i.e., pre-test, post-test, follow-up at 3 months and at 6 months). After the recruitment youth were randomly assigned to the intervention or control condition and we informed parents and youth about the condition they were assigned to. Randomization took place at the individual level using a stratified block design to ensure equality between conditions. The stratified block randomization was based on three factors: gender, age, and TIQ-scores.

Research assistants guided participants during the questionnaire assessment and the sessions of the intervention. All research assistants participated in a training concerning TGF and practiced with the questionnaire assessment protocols and the intervention sessions. The questionnaires were individually administered in a silent room. The research assistants emphasized that there was no right or wrong answer and that their responses would not be shared with others. In accordance with the protocol research assistants read all questions aloud, and used standardized clarification for answering questions. Before the start of the intervention youth in both conditions filled out the

Figure 1
Participant Flow Diagram



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pre-test. After the pre-test youth in the intervention group participated in six sessions of TGF. Youth in the control group attended the school curriculum. After the sixth session was completed youth in the intervention and control group filled out the post-test questionnaire. After three months all youth filled out a shortened follow-up questionnaire and youth in the intervention group thereafter received a booster session. At 6 months follow-up all youth filled out the final follow-up questionnaire. Youth in both conditions could choose a candy bar after completing the questionnaires and all youth received a custom made TGF 'cupcake' after completing the last follow-up. Youth in the control group were granted the opportunity to participate in TGF after completing the study.

Measures

Questionnaires were adjusted to the study's target group in order to reduce the complexity of the questionnaires and task load for the participants in which a majority had an ID. The following questionnaire adjustments were made for youth with ID (Douma et al., 2012; Hartley & MacLean, 2006): difficult words and sentences were simplified, six or seven point Likert scales were replaced with a five point Likert scale, answering categories of the different questionnaires were unified into one and the same type of answering categories (i.e., 'completely untrue', 'untrue', 'not true/ not untrue', 'true', 'completely true'), and answering categories were supported with coloured smileys.

Intervention satisfaction

Participants rated their satisfaction after each session of TGF (quantitative measure of session satisfaction). The participants could grade the sessions (i.e., session grade) with a score in line with the Dutch grading system from 1 (very low) to 10 (very high). The mean of these session grade scores of the six sessions was taken to construct a mean intervention grade (i.e., intervention grade). In addition, participants' satisfaction with the sessions was measured using an adapted version of the Session Rating Scale (SRS; Duncan et al., 2003). The answering format of the SRS items was adjusted from a visual analogue scale into a five point Likert scale. The four items used in this study are 'The assistant listened to me today' (relationship), 'What we did today is important to me' (goals and topics), 'I liked what we did today' (approach and method), and 'I hope next time we will do something similar' (overall). The average score of the four items was taken as an indicator of the satisfaction with each session (i.e., session SRS). The session satisfaction scales showed satisfactory reliability with an average Cronbach's alpha $\alpha = .79$ ranging from $\alpha = .72$ to $\alpha = .84$. Subsequently, the average was taken of the session satisfaction scores of the six sessions to construct a mean intervention SRS score (i.e., intervention SRS), this scale showed excellent reliability with Cronbach's alpha $\alpha = .93$. Previous research also indicated a satisfactory reliability $\alpha = .88$ for the SRS (Duncan et al., 2003). In addition, we asked participants to fill out two open questions (qualitative measure of session satisfaction): 'What did you like about today's session?' and 'What did you not like about today's session?'.

Mindset

Mindset was measured with the Mindset Questionnaire (Verberg et al., 2015) using two subscales 'mindset of intelligence' and 'mindset of emotion and behavior'. Mindset was

measured at four measurement points. The mindset of intelligence scale measures youth's beliefs concerning the malleability of their intelligence and was drawn from the six item 'implicit theories of intelligence scale for children' (Dweck, 1999). An example item of the mindset intelligence scale 'No matter who you are, you can always change a lot about how smart you are'. The scale showed sufficient reliability with Cronbach's alpha $\alpha = .71$ (T0), $\alpha = .75$ (T1), $\alpha = .82$ (T2), and $\alpha = .80$ (T3). For the purpose of this study we constructed an eight item mindset of emotion of behavior scale, based on the scale of 'implicit theories of emotions' (Tamir et al., 2007), measuring youth's beliefs regarding the malleability of their emotions and behavior. An example item of this subscale 'I cannot change a lot about how I feel'. The scale showed sufficient reliability with Cronbach's alpha $\alpha = .70$ (T0), $\alpha = .72$ (T1), $\alpha = .68$ (T2), and $\alpha = .76$ (T3). For both the mindset of intelligence and mindset of emotion and behavior subscales a higher score reflects endorsement of a growth mindset.

Empowerment

Empowerment was measured using the Empowerment questionnaire (EMPO Youth 2.0; Damen & Veerman, 2011). The EMPO youth version measures 'interactional' empowerment (7 items). Interactional empowerment is described as the alertness and willingness to resolve and change undesired situations by taking control and call upon resources (Damen et al., 2017). An example item of the interactional empowerment scale 'I act immediately when there are problems'. Previous research indicates a satisfactory reliability for the subscale interactional empowerment with Cronbach's alpha $\alpha = .71$ (Damen & Veerman, 2011). In the present study the subscale showed sufficient reliability with Cronbach's alpha $\alpha = .70$ (T0), $\alpha = .77$ (T1), $\alpha = .67$ (T2), and $\alpha = .79$ (T3). A higher score indicates stronger feelings of empowerment.

Coping

Coping was measured using the short version of the Cognitive Emotion Regulation Questionnaire (CERQ-short; Garnefski & Kraaij, 2006). Coping was measured at three measurement points. The CERQ-short consists of eighteen items measuring nine emotion regulation strategies with two items per strategy. In the present study the reliability of the strategies positive reappraisal, rumination, and self-blame was insufficient with a Cronbach's alpha $\alpha < .60$. Given the insufficient reliability of several coping strategies, we transformed the CERQ-short into an adaptive coping scale and a maladaptive coping scale. The adaptive coping scale consists of ten items concerning the strategies positive reappraisal, acceptance, positive refocusing, planning, and putting into perspective. An example item of the adaptive coping scale 'If something bad has happened, than I think about how I can change it'. The adaptive coping scale showed sufficient reliability with Cronbach's alpha $\alpha = .69$ (T0), $\alpha = .63$ (T1), and $\alpha = .59$ (T3). A higher score indicates a stronger endorsement of adaptive coping. The maladaptive coping scale consists of eight items of the strategies rumination, catastrophizing, other-blame, and self-blame. An example item of the maladaptive coping scale 'If something bad has happened, than I keep thinking about how terrible it is'. The scale showed satisfactory reliability with Cronbach's alpha $\alpha = .81$ (T0), $\alpha = .80$ (T1), and $\alpha = .82$ (T3). A higher score indicates a stronger endorsement of maladaptive coping.

Self-esteem

Self-esteem was measured using the Dutch Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Franck et al., 2008). Self-esteem was measured at three measurement points. The RSES consists of ten items with a four point scale with answering categories 'completely untrue' to 'completely true'. An example item of the self-esteem scale 'I am satisfied with myself'. Previous research showed satisfactory reliability of the scale with Cronbach's alpha $\alpha = .88$ (Greenberger et al., 2003). In the present study the scale also showed satisfactory reliability with Cronbach's alpha $\alpha = .83$ (T0), $\alpha = .85$ (T1), and $\alpha = .82$ (T3).

Internalizing and externalizing problems

Internalizing and externalizing problems were measured using the Brief Problem Monitor Youth (BPM-Y; Achenbach et al., 2011; Verhulst & Van der Ende, 2013). The BPM consists of nineteen items measuring internalizing problems (6 items) and externalizing problems (7 items) with three answering categories 'completely untrue', 'not true/ not untrue', 'completely true'. We did not use the attention scale (6 items) in this study. An example item of the internalizing problems scale is 'I feel unhappy, sad or depressed', and an example item of the externalizing problems scale is 'I destroy other people's things'. Previous research showed sufficient reliability with Cronbach's alpha $\alpha = .78$ for internalizing problems, and $\alpha = .75$ for externalizing problems (Achenbach et al., 2011). In the present study the subscale internalizing problems showed satisfactory reliability with Cronbach's alpha $\alpha = .84$ (T0), $\alpha = .84$ (T1), $\alpha = .84$ (T2), and $\alpha = .74$ (T3), and the subscale externalizing problems showed sufficient reliability with Cronbach's alpha $\alpha = .76$ (T0), $\alpha = .78$ (T1), $\alpha = .78$ (T2), and $\alpha = .73$ (T3).

Intervention The Growth Factory

The online intervention TGF (Verberg & Helmond, 2015a) was based on scientific research on mindsets and mindset interventions (Dweck, 1999; Yeager et al., 2013, 2016). Yeager and colleagues shared their protocol of a mindset intervention for the purpose of the development of TGF (Paunesku et al., 2015; Yeager et al., 2012). TGF has been developed by a multidisciplinary team of scientists, professionals, and youth with ID to adapt the original mindset intervention to their learning needs. An E-health approach was used to be able to address the information processing needs of youth with ID and enables learning with the fun factor by providing visual support for bringing across the content of the intervention using animations, movie clips and interactive assignments, and by providing auditory support using a voiceover reading aloud the text in the intervention. Visual and auditory support have been suggested as important adjustments in interventions for youth with ID (De Wit et al., 2011). In addition, the online intervention provides a structured learning environment and participants can repeat parts of the session when desired.

TGF is an online intervention that aims to empower youth with ID. The intervention consists of six sessions and a booster session taking 25 to 40 minutes. Youth participate in the sessions under guidance of a research assistant. Before starting the session youth select an avatar who will be their Growth Factory buddy and guide them through

the intervention. Each session is interactive and structured in the same way: (1) start with a welcome by the buddy and a summary of the previous session, (2) participants watch an animation clip in which the content of the session is explained, (3) participants make interactive assignments, (4) the session ends with a summary of the content, (5) participants rate their satisfaction with the session. In session three to five movie clips are shown by 'peer role models' in which these peers share their experiences in how a growth mindset can be helpful in encountering problems. To improve the transfer to daily practice youth receive two messages during the week by text on their mobile phone or by email. The messages contain a reminder of the session's content or a short assignment. In Table 1 one can find the description of the sessions.

Table 1
The Growth Factory Session Description

Session	Content
1. Learning something new	Animation: Participants learn about neuroplasticity. They learn that their brain forms new connections and that connections get stronger every time they practice.
2. Mindset	Animation: The concept of mindset is explained. Participants learn about the fixed mindset and the growth mindset.
3. Growth Mindset: Effort, set-back, and criticism	Animation: Participants learn how people with a growth mindset view effort, set-backs and criticism by others. Also the term 'growth thoughts' is discussed. Peer models: 1. Mycha has a physical and intellectual disability and he has experienced disability acceptance problems and depressive symptoms. He is now more acceptant towards his disability and emphasizes his strengths. 2. Floor has a physical disability and she had emotion regulation problems and showed aggressive behavior. She has learned to regulate her emotions through therapy.
4. Recipe for Growth, part 1 + 2: Effort and good strategies	Animation: Participants learn the 'recipe for growth' = effort + adequate strategy + help from others. They learn the need for effort, as well as the importance of finding an adequate strategy to develop and accomplish goals. Peer models: 1. Patrick has school absenteeism and substance abuse issues and shows delinquent behavior. In therapy he has learned to deal with his problems in more constructive ways and restored his relationship with his father. 2. Tim has motivational and learning problems at school. He has found his passion 'gaming' and would like to pursue a career in gaming. This motivates him to do well in school.

<p>5. Recipe of Growth, part 3: Help from others</p>	<p>Animation: Participants learn that help from others can be essential in learning something new or changing something (e.g., tasks, emotions, behavior). Asking for help and accepting help is not always easy, but everyone needs help, it is normal to need help. Participants learn the five steps plan 'asking for help'.</p> <p>Peer models</p> <ol style="list-style-type: none"> 1. Janka has autism and she has been bullied and ostracized by her peers. She tend to have low self-esteem, but now enjoys living with peers in a group home and has a job at a supermarket. She has experienced she is much more capable than she thought. 2. All characters share their experiences on how asking and receiving help from their network or professionals has supported their development. <p>Gift: Youth receive a magnet with the five steps plan 'asking for help' to stimulate application in practice.</p>
<p>6. Freshen up</p>	<p>The final session is a compilation of all the important lessons of the previous sessions. Gift: After session six youth receive a bracelet with the text 'recipe for growth = effort + strategy + help' to stimulate application in practice.</p>
<p>7. Booster</p>	<p>The booster session is executed three months after session 6 and is a repetition of session 6 reviewing all important lessons of the sessions.</p>

Strategy of analyses

To provide insight into participant's satisfaction with the intervention both quantitative and qualitative analyses are performed. The quantitative analyses report the descriptive in terms of means, SDs, ranges of the session rating scale. The qualitative results provide insight into the answers of the participants into two open questions concerning participant satisfaction. All answers were coded into categories and the frequency of each category was counted. The five highest scoring categories will be discussed in the result section. The categories will be supported by examples of answers. The original citations were translated from Dutch to English leaving spelling errors intact.

To provide insight into the effectiveness of the intervention we first explored the data. A small percentage of data (6.5%) was missing. To test whether our missing data was completely missing at random (MCAR) we performed Little's MCAR test. The test was not significant and therefore we worked under the assumption of MCAR pattern ($\chi^2 = 110.495 (1) = 116, p = .627$). Missing data are imputed using LISREL 8.80 by the Expectation-Maximization (EM) algorithm. All analyses were conducted on both the original and imputed data set and these analyses yielded the same results.

Furthermore, we tested the assumptions of repeated measures ANOVA. There were no extreme outliers except one (Tabachnik & Fidell, 2007). Despite the high Z-value this score was kept intact, because it was in line with the other scores on that variable of this specific participant. Furthermore, the analyses showed that self-esteem and inter-

nalizing and externalizing problems were not normally distributed. Transformation was used to improve the normality of the distribution of these variables with respectively a "reflect and logarithmic" transformation for self-esteem and an "inverse" transformation for internalizing and externalizing problems. After transformation self-esteem was normally distributed ($p > .05$), but internalizing and externalizing problems were not yet normally distributed ($p < .05$). However, in both cases skewness improved as the absolute values of the skewness statistics were no longer more than twice the standard errors indicating normality. There was homogeneity of covariances as assessed by Box's test of equality of covariance matrices for all intervention outcomes. Mauchly's test of sphericity indicated that the assumption of sphericity had been violated for the intervention outcomes mindset of intelligence, mindset of emotion and behavior, and empowerment. In these cases we applied the Greenhouse-Geisser correction.

Next, to test the effectiveness of the intervention we used repeated measures ANOVA. The intervention outcomes (i.e., mindsets, empowerment, coping, self-esteem, internalizing and externalizing problems) at different time points (i.e., pre-test, post-test, follow-up 1 at 3 months, and follow-up 2 at 6 months) were specified as the within subjects factors 'time' and experimental condition (i.e., intervention vs. control) was specified as the between subjects factor 'group'. First omnibus statistics are reported showing whether there is an overall effect of the interaction between time and group. If the omnibus test yielded a significant overall effect further analyses were performed providing insight into effects of the intervention at different time points. In these analyses we compared the pre-test with post-test, pre-test with follow-up 1, and pre-test with follow-up 2. Analyses were conducted using intention to treat principle. In addition, per protocol analyses were conducted with participants in the control group and participants in the intervention group who completed five or six sessions ($n = 25$). Intention to treat and per protocol analyses yielded the same results and therefore, the per protocol analyses were not reported in detail.

Results

Intervention satisfaction

First, we examined participants' satisfaction with the intervention quantitatively (see Table 2). Participants rated TGF with a mean intervention grade of 7.50 ($SD = 1.47$). Session one was rated lowest with a mean session grade of 7.28 ($SD = 2.02$) and session 5 was rated highest with a mean session grade of 8.16 ($SD = 1.31$). Furthermore, participants rated TGF with a mean intervention SRS score of 3.67 ($SD = .68$). Session 6 was rated lowest with a mean SRS session score of 3.61 ($SD = .81$) and session 4 was rated highest with a mean session SRS score of 3.87 ($SD = .67$).

Table 2

Mean Participant Satisfaction with the Online Mindset Intervention The Growth Factory

	SRS item 1	SRS item 2	SRS item 3	SRS item 4	Satisfaction SRS	Satisfaction grade
Session 1	4.54 (.51)	3.41 (.98)	3.79 (.96)	3.38 (1.12)	3.76 (.76)	7.28 (2.02)
Session 2	4.50 (.69)	3.75 (.93)	3.79 (.96)	3.21 (1.07)	3.81 (.73)	7.54 (1.67)
Session 3	4.48 (.64)	3.52 (.98)	3.56 (1.01)	3.11 (1.09)	3.67 (.76)	7.44 (2.03)
Session 4	4.60 (.58)	3.92 (.81)	3.68 (1.03)	3.28 (1.06)	3.87 (.67)	8.00 (1.29)
Session 5	4.44 (.58)	3.56 (.96)	3.68 (.80)	3.32 (.95)	3.75 (.62)	8.16 (1.31)
Session 6	4.52 (.59)	3.45 (1.06)	3.39 (1.08)	3.09 (1.20)	3.61 (.81)	7.78 (1.65)
Mean S1-6	4.48 (.46)	3.63 (.80)	3.54 (.86)	3.16 (.87)	3.67 (.68)	7.50 (1.47)

Note. Item 1: 'The assistant listened to me today' (relationship); Item 2: 'What we did today is important to me' (goals and topics); Item 3: 'I liked what we did today' (approach and method); Item 4: 'I hope next time we will do something similar' (overall).

Next, we explored participants' satisfaction with the intervention also qualitatively using participants' feedback regarding The Growth Factory. Based on the question 'What did you like about today's session?' the following categories reflected youth's positive feedback about the intervention. The category 'content' was mentioned 28 times and taps into statements reflecting on liking the content of the intervention and being interested in the session's content or assignments, for example 'I now know what a mindset is!' and 'Learning that I am capable of more than I think'. The category 'well explained' (24 times) refers to statements by participants concerning the content of the intervention as being well and clearly explained 'That everything was explained so well' and 'That they explain with pictures'. The category 'everything' emerged 24 times, indicating a brief positive but non-specific evaluation of the intervention. The category 'animations and movie clips' (18 times) reflects statements by participants in which they positively refer to the use of the illustrations, animations and movie clips used in the intervention 'The

illustrations were nice and funny' and 'That they show movie clips of other [youth]'. The category 'competent self' was also coded 18 times and reflects participants feelings of competency or achievement 'I had all questions correct', 'That I understand it for once,' and 'It went well and thereby fast!'.

In addition, the following categories reflected youth's negative feedback about the intervention based on the question 'What did you not like about today's session?'. The category 'nothing' emerged most frequently (67 times), indicating participants actually evaluated the intervention positively (e.g., 'nothing!' and 'nothing, I liked it'). The category 'repetition' was coded 20 times and refers to statements that they experienced too much repetition 'Every time repetition' and 'Too much repetition'. Furthermore, in the category 'technical error' (20 times) participant statements reflect technical issues in the intervention 'That the voice-over was stuttering' and 'That the screen was gone while dragging the sentences [drag and drop]'. The category 'boring' was mentioned five times and reflects participants' statements about the intervention being experienced as boring 'Little bit boring, I expected more' and 'I thought it was boring'. Last, the category 'animations and movie clips' (four times) reflects youth disliking some aspects of the animations and movie clips 'The animation figure doing the same thing every time'.

Intervention effectiveness

The repeated measures analysis showed a significant difference between the intervention and control group in the development of mindset of intelligence over time (see Table 3) ($F(2.643, 150.658) = 2.986, p = .039, \epsilon = .881$). The intervention group showed a significantly larger increase in mindset of intelligence compared with the control group from pre-test to post-test ($F(1, 57) = 5.928, p = .018$), but not from pre-test to follow-up 1, or from pre-test to follow-up 2 ($F(1, 57) = .209, p = .649; F(1, 57) = .175, p = .677$). The pre-test to post-test effect had a medium effect size ($d = 0.61$). Next, we did not find significant differences between the intervention and control group in the development of mindset of emotion and behavior over time ($F(2.624, 149.589) = 1.812, p = .155, \epsilon = .875$).

Furthermore, we found significant differences between the intervention and control group in the development of empowerment over time (Table 3) ($F(2.457, 140.039) = 3.828, p = .017, \epsilon = .819$). The intervention group showed a significantly larger increase in empowerment compared with the control group from pre-test to post-test ($F(1, 57) = 5.301, p = .025$), and from pre-test to follow-up 1 ($F(1, 57) = 5.737, p = .020$), but not from pre-test to follow-up 2 ($F(1, 57) = .368, p = .546$). Both the pre-test to post-test, as well as the pre-test to follow-up 1 effects had a medium effect size (respectively, $d = 0.61; d = 0.52$). Moreover, no significant differences between the intervention and control group in the development of adaptive and maladaptive coping over time were found ($F(2, 96) = 2.284, p = .107; F(2, 114) = .861, p = .426$). Finally, no significant differences were found between the intervention and control group in the development of self-esteem, internalizing problems and externalizing problems over time ($F(2, 114) = 1.143, p = .322; F(3, 171) = 2.125, p = .099; F(3, 171) = .761, p = .518$).

Table 3
Means and Standard Deviations for Intervention and Control Group at Measurements T0-T4

	Intervention group						Control group										
	Pre-test		Post-test		Follow-up 1		Follow-up 2		Pre-test		Post-test		Follow-up 1		Follow-up 2		
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	
Mindset																	
Mindset of intelligence	3.56	0.64	3.83	0.58	3.73	0.72	3.82	0.65	3.60	0.69	3.47	0.80	3.84	0.73	3.78	0.74	
Mindset of emotion and behavior	3.74	0.66	3.95	0.50	3.87	0.52	4.03	0.45	3.51	0.46	3.69	0.53	3.86	0.55	3.94	0.53	
Empowerment	3.55	0.51	3.84	0.55	3.84	0.49	3.85	0.52	3.87	0.51	3.85	0.60	3.90	0.53	4.10	0.59	
Self-esteem^a	3.20	0.51	3.38	0.43	-	-	3.88	0.56	3.28	0.46	3.31	0.55	-	-	3.97	0.58	
Coping																	
Adaptive coping	3.20	0.54	3.36	0.41	-	-	3.32	0.42	3.16	0.57	3.21	0.52	-	-	3.48	0.54	
Maladaptive coping	2.73	0.69	2.64	0.66	-	-	2.65	0.74	2.66	0.66	2.59	0.69	-	-	2.43	0.74	
Mental health problems																	
Internalizing ^a	1.51	0.52	1.47	0.49	1.44	0.51	1.47	0.42	1.47	0.49	1.48	0.47	1.39	0.42	1.34	0.35	
Externalizing ^a	1.47	0.39	1.54	0.43	1.47	0.41	1.30	0.29	1.35	0.35	1.42	0.31	1.40	0.38	1.44	0.34	

Note. ^aNon-transformed data is shown

Discussion

In this study we examined feasibility, participants' intervention satisfaction, and the effectiveness of the online mindset intervention The Growth Factory (TGF) in youth with intellectual disabilities and/or mental health problems in a special education setting using a randomized controlled pilot study. This study demonstrated that overall the participants were satisfied with the intervention The Growth Factory. The effectiveness analyses showed that TGF had a medium effect on increasing a growth mindset of intelligence at short-term and increasing empowerment at short (post-test) to midterm (follow-up at 3 months). Furthermore, the intervention TGF did not have a significant effect on mindset of emotion and behavior, self-esteem, coping, and internalizing and externalizing problems in youth with special needs.

In line with our hypothesis and previous research the present study demonstrated a short-term effect of mindset interventions in increasing mindset of intelligence (Blackwell et al., 2007; Donohoe et al., 2012; Orosz et al., 2017). Similar to Donohoe et al. (2012) and Orosz et al. (2017) our study showed that the initial effect of the mindset interventions on mindset of intelligence was not sustained at mid- or long-term. Blackwell et al. (2007) measured only short-term, but not mid- to long-term, effects of the mindset intervention on mindset of intelligence.

Also in line with our hypothesis, the present study showed that the mindset intervention significantly increased empowerment at short- to mid-term. It should be noted that the present mindset intervention was specifically effective in enhancing the initially lower levels of empowerment in the intervention group towards the levels in the control group. The impact of the mindset intervention on empowerment is in line with previous findings that a mindset intervention increased perceived control—a concept closely related to empowerment—on short-term (Schleider & Weisz, 2016b) and mid-term (Schmidt et al., 2017).

In addition, our study did not find a significant effect of the mindset intervention on mindset of emotion and behavior while previous studies demonstrated short-term effects of mindset interventions on mindset of personality and attributes, concepts closely related to mindset of emotion and behavior (Da Fonseca et al., 2008; Schleider & Weisz, 2016b; Yeager et al., 2013). Most studies only measured short-term effects on mindsets, therefore, little is known yet about the long-term impact of mindset interventions on mindset of personality.

In contrast to our expectations and previous research we did not find a significant effect of TGF on self-esteem, coping, and internalizing and externalizing problems. Previous studies showed short to long-term effects on depressive and anxiety symptoms, self-esteem, conduct problems, stress, health, and grades (Da Fonseca et al., 2008; Miu & Yeager, 2015; Schleider et al., 2016b; Yeager et al., 2013, 2014). Several explanations come to mind for the lack of effectiveness of the intervention on mindset of emotion and behavior, self-esteem, coping, and internalizing and externalizing problems. Du-

ring our pilot study research assistants observed that for some participants the connection between thought, feelings and behaviors might have been unclear, this might have hindered the effectiveness of the mindset intervention on changing mindset of emotion and behavior. Mindset of personality is more strongly associated with internalizing and externalizing problems than mindset of intelligence (Schleider et al., 2015). Even though the intervention was effective on mindset of intelligence, this effect might not have been strong enough to subsequently impact outcomes such as self-esteem, coping, and internalizing and externalizing problems. While previous research showed that brief psychological interventions such as a mindset intervention can be effective in promoting youth positive development, it might be that a six session intervention with a booster session is too short for youth with special needs to change existing thinking and behavioral patterns.

Strengths and limitations

There are a number of limitations of this study that should be considered. First of all, the sample size of the present study is small. A power analysis demonstrated that a sample of $N = 106$ participants is necessary to establish small to medium effect sizes and a sample of $N = 28$ participants is needed to detect medium effect sizes. In our study we did establish medium effect sizes of the intervention on mindset of intelligence and empowerment. The present study was specifically designed as a pilot randomized controlled trial to obtain preliminary *insights* into feasibility, satisfaction, and effectiveness of the new online intervention TGF and to further improve the intervention. Another limitation of the present study was the difference between the intervention group and control group on pre-test levels of empowerment. The intervention group reported lower levels of empowerment than the control group. Therefore, the intervention group had more room for improvement concerning empowerment than the control group. Furthermore, analyses showed that dropouts had significantly higher levels of externalizing behaviors. Therefore, one has to be careful generalizing the results of this study to the population, especially to youth high on externalizing behavior. A final limitation of the present study is that it is solely based on participants' self-reported questionnaires while effectiveness outcomes reported by multiple sources or behavioral tasks aside questionnaires would strengthen the effectiveness outcomes of the intervention.

Despite these limitations the present study is innovative and clinically relevant in several ways. TGF is the first mindset intervention that has been specifically developed for youth with ID and the effectiveness of mindset interventions for youth with special needs has not been established yet. Another innovative aspect of the intervention is the E-health approach using an online format for the intervention delivery. The present study makes an important contribution by studying the feasibility, satisfaction and effectiveness of TGF in youth with ID and mental health problems in a special education setting using a randomized controlled trial with four measurement moments including a 6 months follow-up period.

Practical implications

Based on the present pilot study the intervention TGF was further improved based on valuable feedback of participants and observations of research assistants into TGF 2.0. Therefore, the mandatory repetition of the animation was made optional for participants. Other repetitions in the sessions remained, because the intervention was developed for youth with ID who generally benefit from repetition of information (De Wit et al., 2011). In addition, the technical errors were solved and the reminder function was optimized by the technical team. Furthermore, we developed a workbook for participants in order for participants to have a tangible product to work in aside the online sessions further facilitating transfer to daily life. We also developed a more detailed assistant's manual with the scientific background of TGF and with a thorough explanation of the objective and content of each session. Next, we developed a participant and content checklist serving as a measure of program integrity. Finally, research assistants observed that for some participants the connection between thoughts, feelings and behaviors was unclear. Therefore, we added additional assignments in which these relationships were explicitly discussed and practiced.

Future research

Studies into the effectiveness of mindset interventions should use well designed randomized controlled trials and should examine both the short to long-term impact of the intervention on the supposed working mechanism of growth mindset and on subsequent academic, social emotional, and behavioral outcomes. These studies are needed to provide more insight into how mindset interventions work; whether the effects of mindset interventions on subsequent outcomes are indeed due to increases in growth mindset. In addition, more research needs to be done on the potential effectiveness of mindset interventions for clinical groups of youth. It has been suggested that mindset interventions could be specifically beneficial for youth with psychopathology (Schleider et al., 2015) and brief mindset interventions could catalyze current treatment programs for youth with psychopathology (Kneeland et al., 2016).

Conclusion

The implementation of the online mindset intervention TGF for youth with intellectual disabilities and/or mental health problems in a special education setting was feasible and TGF was positively evaluated by the majority of the participants. The intervention was effective in improving mindset of intelligence at short-term, and in improving empowerment at short to mid-term, but the intervention had no effect on coping, self-esteem, and internalizing and externalizing problems. The intervention has been improved based on the pilot study and TGF 2.0 will be tested on effectiveness in a full-scale randomized controlled trial with repeated measures in a sample of $N = 120$ youth with ID in special education and residential care.

Chapter 4

Protocol for a randomized controlled trial

4

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Abstract

Background

Adolescents with intellectual disabilities have an increased risk of developing academic, social and psychological problems compared with non-disabled peers. These difficulties might have an impact on the implicit theories—or so called mindset—of these youth. Youth with a fixed mindset believe that their attributes are static while youth with a growth mindset believe their attributes are malleable. A growth mindset can positively affect the academic and psychosocial development of youth and can be stimulated by so called ‘mindset interventions’. Nevertheless, mindset interventions specifically adapted to adolescents with intellectual disabilities are non-existing.

Methods/design

The aim of the present study is to conduct a randomized controlled trial (RCT) to test the effectiveness of the online mindset intervention “The Growth Factory” aimed to teach adolescents with intellectual disabilities a growth mindset and thereby positively impacting their psychosocial development. The RCT targets adolescents (12–23 years) with mild to borderline intellectual disabilities (IQ 50–85) admitted to residential care or special education. Participants will be individually randomized to the intervention ($n = 60$) or control ($n = 60$) group. The intervention group will individually participate in the six sessions of “The Growth Factory” and the control group will receive care as usual. Primary outcome will be mindset. Empowerment, behavior problems, self-esteem, treatment motivation, therapeutic alliance, challenge seeking and the impact of social exclusion will be included as secondary outcome measures. Moreover, moderation (i.e., intervention satisfaction, IQ, age, baseline mindset, gender) and mediation effects will be investigated. Self-reported and mentor assessments will be administrated at baseline, post-test and at three (except mentor assessment) and six months follow-up.

Discussion

This paper describes the design of a RCT examining the effectiveness of the online mindset intervention “The Growth Factory” aimed to empower adolescents with intellectual disabilities. If effective, “The Growth Factory” makes an important contribution to the treatment and psychosocial development of adolescents with intellectual disabilities in residential care and special education. Due to the online approach, implementation will be efficient and cost-effective and therefore the intervention “The Growth Factory” can be used on large scale.

Background

Youth with intellectual disabilities are highly vulnerable and experience more difficulties and delays in academic, social and adaptive skills (Dekker & Koot, 2003; McDiarmid & Bagner, 2005; Schalock et al., 2010; Trout et al., 2009). In addition, research shows that young people with intellectual disabilities have an increased risk of developing emotional and behavioral problems (Alimovic, 2013; Allen, 2008; De Ruiter et al., 2007; Dekker & Koot, 2003; Dekker et al., 2002; McDiarmid & Bagner, 2005; Pruijssers et al., 2014; Trout et al., 2009). Youth with intellectual disabilities show more externalizing problems such as attention problems and aggressive behavior than their non-disabled peers. The same holds for internalizing problems such as depression and anxiety (Alimovic, 2013; De Ruiter et al., 2007; Dekker & Koot, 2003; Dekker et al., 2002; Green et al., 2015; Hauser-Cram & Woodman, 2016; Trout et al., 2009). Moreover, youth with intellectual disabilities often suffer from overprotective care (Holmbeck et al., 2002; Ozhek, 2008; Sheppard & Unsworth, 2011). Due to their disabilities, many youth with intellectual disabilities are restricted by caregivers' low expectations and fear for their safety (Sheppard & Unsworth, 2011). Overprotective care may hamper identity building, independence and autonomy in youths with intellectual disabilities, and is related to psychosocial maladjustments (Holmbeck et al., 2002; Ozhek, 2008; Sheppard & Unsworth, 2011).

The experience of academic and psychosocial problems, amongst other factors, might have an impact on the implicit theories of youth with intellectual disabilities. Implicit theories—also referred to as mindset – are core assumptions about the malleability and controllability of particular attributes such as intelligence, emotion, behavior, and personality (Dweck, 1999, 2006). These implicit theories create a framework for interpreting the meaning of events in one's world. Two types of mindsets can be distinguished, that is a fixed mindset (an entity view) and a growth mindset (an incremental view).

In particular, youth with a fixed mindset consider attributes such as intelligence and personality to be static and unchangeable. For example, they might believe that people have certain personality traits that cannot be altered (Dweck 2006). For this reason, effort is seen as useless and hard work will be without results or success. Furthermore, youth with a fixed mindset will tend to avoid challenging situations and will see setbacks as threatening and self-defining because it indicates a general lack of ability (Dweck, 1999, 2006). As a result, people endorsing a fixed mindset may not achieve their full potential. In contrast, people with a growth mindset believe people's characteristics have the potential to change and see these attributes to be dynamic. For example, they may believe that everyone can take steps to develop their personality and behavior over time (Dweck 2006). For this reason, those who believe these attributes are malleable tend to engage in behaviors that will help them to develop their abilities, such as expanding effort to improve and embrace challenges as opportunities to grow (Dweck, 1999, 2006). As a result, youth with a growth mindset intend to use their full potential and therefore might reach higher levels of academic achievement and psychosocial functioning (Dweck, 1999; Robins & Pals, 2002; Schleider et al., 2015). The present study focuses specifically on the impact of a growth mindset on enhancing the psychosocial development of youth with intellectual disabilities.

Indeed, an extensive amount of research has shown significant associations between mindsets and a wide range of psychological outcomes (Robins & Pals, 2002; Schleider et al., 2015; Shirk & Saiz, 1992; Yeager et al., 2011, 2016). The psychological constructs in the present study to assess effectiveness outcomes of the intervention will be discussed. Research has shown that a growth mindset is associated with psychological empowerment (Schleider & Weisz, 2016b). Empowerment is the experienced personal competence and perceived control to handle important matters (Bandura, 1994; Damen & Veerman, 2011; Zimmerman, 1995). In addition, the belief in the malleability of one's own capabilities impacts one's self-regulation of behavior and motivation (Bandura, 1994; Blackwell et al., 2007; Burnette et al., 2013; Robins & Pals, 2002; Schleider & Weisz, 2016b). For example, people with a growth mindset set goals focused on learning to increase their ability (Blackwell et al., 2007; Burnette et al., 2013; Robins & Pals, 2002) as they are more likely to prefer challenging activities compared to people with a fixed mindset (Yeager et al., 2016). Furthermore, people with a growth mindset employ mastery-oriented strategies by displaying more willingness to work hard and persistently, even when faced with adversity, to reach their goals (Burnette et al., 2013; Edelen et al., 2007; Robins & Pals, 2002; Tokar et al., 1996). Consequently, people endorsing a growth mindset are more likely to be confident in successfully making a change and therefore more likely to be motivated for treatment (i.e., treatment readiness) to improve their emotions and behavior (Burke et al., 2003; Edelen et al., 2007).. Subsequently, a growth mindset might also be related to building positive therapeutic relationships (Joyce & Piper, 1998; Shirk & Saiz, 1992; Tokar et al., 1996). For example, people who have a growth mindset believe in personal responsibility for working hard and achieving progress and therefore are more likely to evaluate their relationship with their counselor as collaborative and productive than people with a fixed mindset (Tokar et al., 1996). In addition, a growth mindset is related to lower levels of internalizing and externalizing problems, such as anxiety, depression and aggressive behavior (De Castella et al., 2013; Plaks, 2017; Schleider et al., 2015; Schroder et al., 2015; Tamir et al., 2007). Moreover, mindsets are associated with (long-term change in) self-esteem, with people with a fixed mindset showing lower levels of self-esteem and a downward spiral in self-esteem levels in response to new (academic) challenges compared to those with a growth mindset (De Castella et al., 2013; Robins & Pals, 2002). Finally, mindsets are related to people's social relationships (Plaks, 2017; Rudolph, 2010; Yeager, 2017; Yeager et al., 2011, 2014). Specifically, a fixed mindset has been related to a greater desire for vengeance when adolescents recalled recent conflicts in their lives (Yeager et al., 2011). Moreover, children with a fixed mindset are more likely to demonstrate internalizing and externalizing health problems when victimized (Rudolph, 2010; Yeager et al., 2014).

In sum, a growth mindset can positively impact adolescents' academic, social and psychological development. Therefore, so called 'mindset interventions' have been developed to teach children and adolescents a growth mindset. Mindset interventions are brief psychological interventions based upon the previously described scientific research concerning implicit theories of intelligence and personality (Yeager et al., 2013). A key message of mindset interventions is that attributes are malleable and can be changed. Thus, these interventions show the plasticity of the brain and the impact of ef-

fort and practice. Furthermore, the focus of these mindset interventions is on implicit and unconscious beliefs instead of teaching new skills or behavior (Yeager et al., 2013). Mindset interventions are generally one to eight sessions long and are executed face-to-face or using a computer program using an individual or group format.

Interestingly, mindset interventions have been shown to be successful in stimulating a growth mindset and subsequently positively impacting adolescents' academic performance and psychosocial functioning (Aronson et al., 2002; Blackwell et al., 2007; Koestner et al., 1995; Miu & Yeager, 2015; Salekin et al., 2012; Yeager et al., 2013, 2014). First, mindset interventions showed the predicted effect of increasing a growth mindset in adolescents (Donohoe et al., 2012; Miu & Yeager, 2015; Orosz et al., 2017; Schleider & Weisz, 2016b; Yeager et al., 2014). Second, mindset interventions significantly increased feelings of empowerment in youth (Schleider & Weisz, 2016b). Third, previous research found that after a short growth mindset manipulation youth were more willing to take on challenges compared to youth who received a fixed manipulation (Koestner et al., 1995; Yeager et al., 2016). Fourth, providing youth with conduct problem and psychopathic features with an intervention including a growth mindset component demonstrated increased positive emotion and improvement in treatment amenability (i.e., awareness of problems, motivation to change, and consideration and tolerance of others) (Salekin et al., 2012). Fifth, mindset interventions can make an important contribution to the prevention and reduction of behavioral problems (Donohoe et al., 2012; Miu & Yeager, 2015). In particular, a brief mindset intervention teaching adolescents that people can change prevented internalizing problems (e.g., symptoms of depression) (Miu & Yeager, 2015) and externalizing problems (e.g., aggression) (Yeager et al., 2013). Sixth, a single session intervention teaching a growth mindset of personality was effective in preventing a decline in self-esteem (Miu & Yeager, 2015). Finally, mindset interventions had a positive impact on social relationships (Yeager et al., 2011, 2013). For example, youth who have participated in a mindset intervention responded less aggressive and more prosocial in reaction to social rejection compared to youth in the control group (Yeager et al., 2013).

Despite these impressive findings, previous mindset research has been mainly conducted in educational settings with adolescents without disabilities. However, according to a few studies, children and adolescents with intellectual disabilities are more likely to endorse a fixed mindset than peers without disabilities (Baird et al., 2009; Koestner et al., 1995; Verberg et al., 2019). Furthermore, research shows that a growth mindset is related to higher levels of empowerment and self-esteem in youth with intellectual disabilities (Verberg et al., 2019). Also, higher levels of a growth mindset are related to lower levels of internalizing problems, attention problems, externalizing problems, and total behavior problems (Verberg et al., 2019) and are not associated with challenge avoidance (Baird et al., 2009; Koestner et al., 1995). These results suggest that teaching a growth mindset might make a significant contribution to the development of youth with intellectual disabilities. However, mindset interventions adapted to the needs of adolescents with intellectual disabilities are lacking. Therefore, we developed a brief six session online mindset intervention "The Growth Factory" aimed to teach youth with intellectual disabilities a growth mindset.

In a randomized controlled pilot study ($n = 59$) we showed that it was feasible to implement the online intervention in practice and that the majority of adolescents with psychiatric problems often combined with intellectual disabilities evaluated “The Growth Factory 1.0” positively (Helmond et al., 2022). The pilot study also demonstrated that the intervention significantly increased a growth mindset and feelings of empowerment of adolescents with intellectual disabilities and/or psychiatric problems in comparison with a control group—although the intervention did not show the expected beneficial downstream effects on internalizing problems, externalizing problems, and self-esteem. Based on these findings, and on participant and trainer evaluations in the pilot study, “The Growth Factory 1.0” was further improved into “The Growth Factory 2.0”—in this article further referred to as “The Growth Factory”—to increase the effectiveness of the intervention for adolescents with intellectual disabilities. Some important changes were the correction of technical errors, the addition of a participant workbook, and the addition of two assignments on the relationship between cognitions and behavior.

The primary aim of the present study therefore is to examine the effectiveness of the online intervention “The Growth Factory” using a full scale randomized controlled trial (RCT) with four measurement moments. “The Growth Factory” aims to empower youth with intellectual disabilities by stimulating the development of a growth mindset and thereby positively impacting their psychosocial development. We hypothesize that adolescents in the intervention group will show larger increases in growth mindset (primary outcome). Furthermore, we hypothesize that adolescents in the intervention group will show greater improvements in empowerment, self-esteem, treatment motivation, and therapeutic alliance as well as a larger reduction of internalizing problems, attention problems, externalizing problems, and total behavior problems compared with adolescents in the control group (secondary outcomes). Finally, we hypothesize that adolescents in the intervention group will seek challenges more and will be less negatively impacted by social exclusion compared with adolescents in the control group (secondary outcomes). In addition, the secondary aim of this study is to gain insight for whom the intervention “The Growth Factory” is effective (i.e., moderation) and how the intervention works (i.e., mediating). Intervention satisfaction, level of intellectual disability (mild intellectual disability versus borderline intellectual functioning) and baseline mindset will be tested as moderators of the effects of the online mindset intervention. We hypothesize that the intervention will lead to a significant increase in growth mindset and empowerment in participants. In addition, we hypothesize that adolescents with higher intervention satisfaction scores, borderline intellectual functioning, and a fixed mindset at baseline will show larger increases in growth mindset and empowerment compared to adolescents with mild intellectual disabilities, who report less satisfaction with the intervention, and a more growth oriented mindset at baseline. In addition, we will test whether age and gender moderate the intervention effect. Finally, we will test the mediating role of mindset and empowerment on the effect of the mindset intervention on the secondary outcomes measures.

Methods

The study design will be reported in accordance with the CONSORT 2010 statement for reporting parallel group randomized trials (Schulz et al., 2010). The Ethics Committee of the University of Amsterdam in the Netherlands has approved the study (2015-CDE-4518). Moreover, the study is registered in the Dutch Trial Register for RCT's (NTR5460).

Design

The present study involves a randomized controlled trial with two conditions: an intervention group and a control group with four measurements at pre-test, post-test, follow-up at 3 months and 6 months. Figure 1 shows a schematic overview of the design in the present study.

Participants

Participants that will be selected for the study are (late) adolescents (12 to 23 years) with mild to borderline intellectual disabilities, including youth with mild intellectual disabilities (IQ 50–69) and borderline intellectual functioning (IQ 70–85) and deficits in adaptive functioning. Besides an intellectual disability participants could have accompanying physical disabilities or psychiatric problems. Participants are clients in residential care or students in special education. Exclusion criteria are the presence of severe emotional problems hindering participation in the study, such as extreme aggression problems or an acute unstable mental condition. Participants who agree to participate will be included in the study when both adolescent and parents or legal representative provide written informed consent.

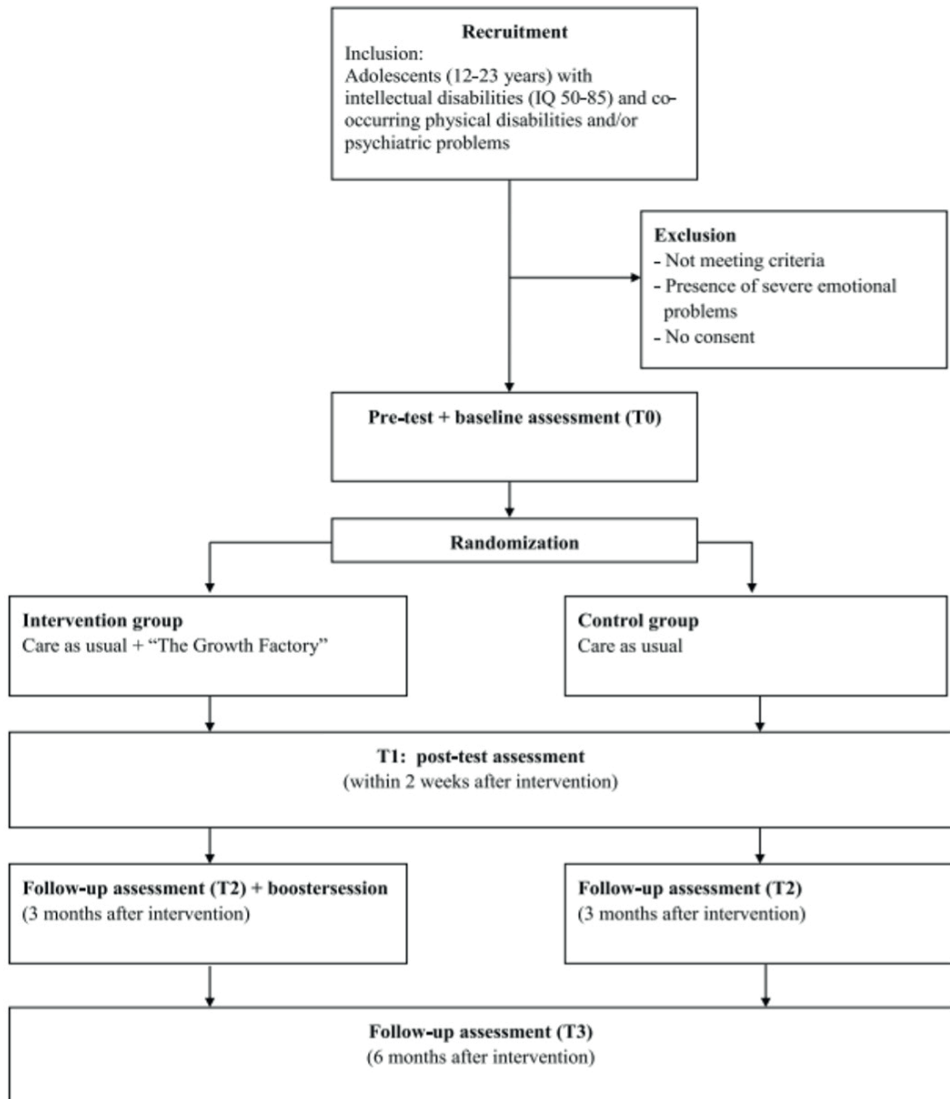
A power analysis (Faul et al., 2009) was performed to calculate the sample size required in the present study. Based on previous research on the effectiveness of mindset interventions in education (Yeager et al., 2013), the expectation is to find a small to medium effect ($d = 0.25$). The power calculation (two-tailed, alpha 0.05, statistic power 0.80) based on a three measurements design shows that 106 participants are necessary. Therefore, our aim is to include $N = 120$ participants ($n = 60$ intervention condition; $n = 60$ control condition) in the RCT taking into consideration 10% attrition.

Procedure

Treatment coordinators of the institute and the school psychologists will screen youth for inclusion and exclusion criteria. After that, parents or legal representatives will receive an information letter containing a digital link and response letter to sign-up if they wish their child to participate in the study (active informed consent). In addition, adolescents will be informed approximately a week before the first screening by two research assistants in their classroom or group. If potential participants are absent or if they need extra information, information will be given individually. If adolescents also agree with participation, active written informed consent will be obtained. After that, participants will be randomly allocated to either intervention condition or control condition. Randomization will take place at individual level using a stratified block design to ensure equality between conditions. The stratified block randomization will be based

Figure 1

Study Design. Flow Diagram of Recruitment, Inclusion and Exclusion Criteria, Randomization and Different Assessments.



on three factors: gender, age and IQ. Parents, mentors and teachers will be informed by a letter about the condition their child is assigned to.

Before filling out the pre-test, all participants will complete a short questionnaire containing questions regarding their living group or class and additional therapies (i.e., physiotherapy, speech therapy, social skills training). After that, the pre-test (T0) will be assessed. After the pre-test, youth in the intervention group will participate in the intervention “The Growth Factory” with six sessions lasting 25 to 40 minutes. Moreover, participants will receive care as usual parallel with “The Growth Factory”. Parents will also receive a log in to be able to follow the sessions at home. Youth in the control group will receive care as usual. After completion of the trial participants in the control condition will be given the opportunity to participate in “The Growth Factory”.

After completing the sessions of “The Growth Factory”, all participants will be assessed at post-test (T1) and a follow-up at 3 months (T2) and 6 months (T3). Furthermore, participants in the intervention group will also receive a booster session directly after the 3 months follow-up. Research assistants will guide the participants individually during the assessments and intervention in a silent room using a protocol. In line with the assessment protocol all questions will be read aloud and a standardized clarification for questions will be used. Additionally, assistance will be provided in case participants need help to complete the forms. To minimize any connection between the intervention and the measures, different research assistants will collect the measures apart from the one who guided the youth during the sessions. All research assistants will participate in four training sessions and have a bachelor or master degree or are in the final year obtaining their degree.

During the sessions, participants in the intervention condition will receive a small gift (i.e., a refrigerator magnet with the five steps to ask for help in an appropriate way, and a bracelet with the ‘recipe of growth’) after completing session five and six. Furthermore, all participants receive a thumbs-up flashlight and small ‘brain stressball’ after completing the first and second follow-up measurement.

Intervention

“The Growth Factory” is an online intervention that aims to empower adolescents with intellectual disabilities. The intervention is based on scientific research on implicit self-theories and mindset interventions by Carol Dweck and David Yeager (Dweck, 199; Yeager, 2017; Yeager & Dweck, 2012; Yeager et al., 2013; Yeager & Walton, 2011). A multidisciplinary team of professionals and youth has developed the intervention using a Dutch guideline for effective interventions for people with intellectual disabilities (De Wit et al., 2011). By using an online approach in the intervention we were able to address the information processing needs of youth with intellectual disabilities. For example, by providing visual and auditory support, using interactive assignments and animations and the possibility to repeat parts of the session. The adapted intervention has been tested in a pilot study with adolescents with intellectual disabilities and/or psychiatric problems (Helmond et al., 2022). After that, improvements were made which resulted in the current program “The Growth Factory (2.0)” (Verberg & Helmond, 2015a).

“The Growth Factory” consists of six sessions and one booster session, each lasting for 25–40 minutes. Youths participate in the sessions in a silent room under guidance of a research assistant using a protocol. The assistant will check whether the participant understands the information and provide help if needed. Furthermore, during the sessions the assistant will make observations concerning understanding, pauses needed, attitude and attention. These and any other important observations will be written down on a checklist after each session.

Before the start of the first session, participants choose an avatar who will guide them through the sessions. Each session has the same structure: (1) previous week’s homework assignments are discussed with the research assistant, (2) a welcome by the avatar including a summary of the previous session and an introduction of the upcoming theme, (3) an animation clip in which the content of the session is explained, (4) two interactive assignments, (5) a summary with the most important messages of the session, (6) a goodbye by the avatar, (7) participants rate their satisfaction with the session, and (8) homework assignments are explained by the research assistant.

In the first session, the participants learn about the plasticity of the brain, that the brain is more like a muscle and that people can grow their brain by ‘exercising’. Specifically, youths are told that the connections in their brain multiply and get stronger when they use them. In session two, participants learn about growth and fixed mindsets. Specifically, they learn that people with a growth mindset believe they can develop their abilities through (mental) exercise. People with a fixed mindset believe people cannot really change and are convinced that abilities, cognitions and personality are set. In session three, participants learn that a growth mindset helps to accomplish goals. Moreover, they learn that people with a growth mindset will embrace challenges, persist in the face of setbacks and see effort as a strategy needed to reach one’s potential. Also, participants practise with so called ‘grow thoughts’. In session four, participants learn about the ‘recipe of growth’, which consist of three important ingredients. The first two ingredients of the recipe for growing your brain: ‘effort’ and ‘good strategies’ are taught in the fourth session. To develop abilities and skills, both effort and practise are of great importance. Furthermore, finding the best strategy to accomplish a goal is important. In the fifth session, the third ingredient ‘help from others’ is explained. Participants learn that sometimes it can be rewarding to ask for help or accept help from others. They also learn the five steps to ask for help in an appropriate way. The sixth session is a compilation of the previous sessions. The most important information is repeated. Moreover, this session will be used as the booster session after the 3 month follow-up. In addition, in sessions three, four, and five movie clips are shown about ‘peer role models’ in which these peers share their experiences in how a growth mindset helped them in encountering problems and accomplishing goals. Also, these three sessions contain additional assignments at the end of the session to practise the content of the session with the research assistant. Session three and four contain exercises based on the principles of cognitive behavioral therapy. Youth practise to recognize negative thoughts in a social situation and change these thoughts into so called ‘growth thoughts’. In session five youth practise asking for help using the five steps in a role play.

Every week, the participants receive two messages by mobile phone and/or email containing a reminder of the session's content or a short assignment. The purpose of these messages is to improve the transfer from the online intervention into daily life. Furthermore, each participant receives a workbook. Every week, a few homework assignments need to be completed. The research assistant discusses homework assignments with the participant before starting the next session.

Care as usual

Participants assigned to the control condition will receive care as usual. Adolescents recruited from a special education school attend the school curriculum and are supervised by a mentor teacher. In addition, a school psychologist is involved in the educational learning process and provides specific orthopedagogical advice. Each student receives a 'developmental perspective plan' based on the youth's specific developmental needs. Furthermore, additional therapies are offered depending on the youth's care need, such as resilience training and creative arts therapies (e.g., art, music, and/or dramatherapy). Specifically, for youth with physical disabilities physiotherapy, ergotherapy, and medical assistance are offered. Adolescents recruited from a specialized residential care institute receive an 'individual treatment plan' in which treatment goals and plans are formulated based on the youth's specific developmental needs. A multidisciplinary team is involved in these treatment programs. One of the group care workers is the youths' mentor who provides guidance and support based on the treatment goals and plans. Furthermore, additional therapies are offered, such as physiotherapy, medication management, and resilience training; and sometimes a family social worker is involved. Also, in residential care youth receive medical assistance when needed. Youth care workers provide care using a "strength based approach" which focusses on the individuals' strengths, potential, and self-determination.

Instruments/Measures

Instruments will be adjusted to reduce the complexity of the questionnaires for the participants with intellectual disabilities using the Dutch guideline for the development and adjustment of diagnostic instruments for people with intellectual disabilities (Douma et al., 2012). The answering categories of the different questionnaires will be unified into one format of answering categories ranging from 'completely untrue' to 'completely true'. Difficult words and sentences will be simplified and coloured emoticons corresponding with the answering categories will be added. The pilot studies showed the questionnaires to be suitable for youth with intellectual disabilities (Helmond et al., 2022; Verberg et al., 2019). Table 1 shows an overview of study outcome measures and the informants that will be involved in each assessment.

Table 1
Overview of Assessments

	T0	Session 1-6	T1	T2	T3
Adolescent					
Mindset (MQ)	x		x	x	x
Empowerment (EMPO Youth 2.0)	x		x	x	x
Behavior problems (BPM-Y)	x		x	x	x
Self-esteem (RSES)	x		x		x
Treatment motivation (MYTS)	x		x		x
Therapeutic alliance (TASC-r)	x		x		x
Challenge seeking (Puzzles)					x
Impact of social exclusion (Cyberball game)					x
Intervention satisfaction (SRS)		x			
Mentor*					
Mindset (MQ)	x			x	x
Empowerment (EMPO 2.0)	x			x	x
Behavior problems (BPM-P)	x			x	x

*Mentor is defined as school mentor or social worker from the group.

Screening measures

For all participants, information regarding gender, age, IQ scores, and diagnosis will be provided by the treatment coordinator or school psychologist. Participants will provide information about setting (residential care group or homestay) and attributional treatment (e.g., physiotherapy, speech therapy, social skills training).

Primary outcome measure

Mindset will be measured with the Mindset Questionnaire (MQ; Verberg et al., 2019). The MQ consists of two parts: (1) two subscales measuring youth's implicit theories: mindset emotion/behavior (6 items, e.g., 'I can control the feelings I have') and mindset intelligence (3 items, e.g., 'I can learn new things, but I can't really change my basic intelligence'), and (2) the subscale 'perseverance' measures youth's self-regulatory behavior (9 items, e.g., 'If something does not work, I quit' and 'By practising a lot I'm getting better'). The original six point Likert scale was replaced by a five point Likert scale (Hartley & MacLean, 2006), ranging from 1 ('completely untrue') to 5 ('completely true'), with higher scores indicating a higher endorsement of a growth mindset. Furthermore, the

pilot studies showed that the MQ is suitable for youth with intellectual disabilities (Helmond et al., 2022; Verberg et al., 2019) and the validity and reliabilities of the subscales ranged from just sufficient to satisfactory (Helmond et al., 2022; Verberg et al., 2019). In addition to self-report of youth, participants mentor will complete the MQ about their view on participant's mindset and self-regulatory behavior.

Secondary outcome measures

Empowerment will be measured with the Dutch questionnaire 'EMPO Jongeren 2.0' (EMPO Youth 2.0; Damen & Veerman et al., 2011). The EMPO Youth 2.0 consists of 16 items measured on a 5-point scale ranging from 1 ('completely untrue') to 5 ('completely true'). The subscale 'intrapersonal' contains nine items (e.g., 'I am in control of myself') as the scale 'interactional' consists of seven items (e.g., 'I make use of advice or support from people around me, if necessary'). The items were slightly rephrased to avoid misunderstandings due to literal interpretation. The EMPO Youth 2.0 demonstrates sufficient reliability (Damen & Veerman et al., 2011; Helmond et al., 2022; Verberg et al., 2019). Also adolescent's mentor will complete the EMPO Youth 2.0 questionnaire about their view on adolescent's empowerment.

Internalizing, attention and externalizing behavior problems will be assessed using the Dutch translation of the 'Brief Problem Monitor for Youth' (BPM-Y; Achenbach et al., 2011; Verhulst & Van der Ende, 2013). The BPM-Y contains 19 items measuring internalizing problems (6 items), attention problems (6 items) and externalizing problems (7 items). The items will be rated on a 3-point scale. The original categories 'not true', 'somewhat true' and 'very true' were replaced with 'completely untrue', 'not true/ not untrue' and 'completely true' to match with the answering categories in the other questionnaires. An example item of the externalizing problems scale 'I threaten other people'. The BPM-Y demonstrates sufficient and satisfactory reliability (Achenbach et al., 2011; Helmond et al., 2022; Verberg et al., 2019). In addition, adolescent's mentor will complete the questionnaire about their view on behavior problems using the parent version of the BPM, the 'Brief Problem Monitor for Parent figures' (BPM-P; Achenbach et al., 2011). This scale offers good to excellent internal consistency and acceptable to good test-retest reliability (Achenbach et al., 2011).

Self-esteem will be assessed using the Dutch translation of the 'Rosenberg Self-Esteem Scale' (Rosenberg, 1965). The scale is a ten item Likert scale with items answered on a 4-point scale. The original four answering categories 'strongly agree' to 'strongly disagree' were reformulated into 'completely untrue' to 'completely true' to match the answering categories in the other questionnaires. An example item is 'I am able to do things as well as most other people'. The instrument possesses satisfactory reliability (Greenberger et al., 2003; Helmond et al., 2022; Verberg et al., 2019).

Treatment Motivation will be measured with the Motivation for Youth's Treatment Scale (MYTS; Breda & Riemer, 2012), an eight item measure that assesses problem recognition (e.g., 'My behavior is making my life worse') and treatment readiness (e.g., 'If I attend counseling I think my life will get better'). The original 5-point answer-

ring categories 'strongly disagree' to 'strongly agree' were replaced with 'completely untrue' to 'completely true'. Three changes were made in the treatment readiness scale, because participants at the institutional care already receive counseling. Therefore, the word 'extra' was added to the sentences about getting counseling (e.g., 'Getting extra counseling seems like a good idea to me'). Furthermore, the sentence 'Complete these two questions only if you get extra counseling' was added because not all pupils already receive extra assistance. Moreover, the question 'I get extra counseling because others think I need it' was added to complete the questionnaire. The original version of the MYTS offers a brief and reliable tool to assess treatment motivation among youth and caregivers. The internal consistency of this instrument is good (Breda & Riemer, 2012).

Therapeutic alliance will be measured with the Dutch translation of the Therapeutic Alliance Scale for Children, revised (Shirk & Saiz, 1992). The instrument contains 12 items and distinguishes between the affective bond (6 items, e.g., 'I like spending time with my therapist') and client-therapist collaboration (6 items, e.g., 'I'd rather do other things than meet with my therapist'). The word 'therapist' is reformulated into 'mentor' to better fit the target group. Before participants start to complete the questionnaire the assistant will make clear about whom (mentor from school or youth care group) the questionnaire has to be filled in. The original items are rated on a 4-point Likert scale 'not true' to 'very much true'. These categories were changed into the 5-point answering categories 'completely untrue' to 'completely true' to match the answering categories of the other measures used. The scale has demonstrated adequate internal consistency and validity in previous investigations (Ormhaug et al., 2014; Shirk & Saiz, 1992).

Challenge seeking will be assessed by using the experimental task 'puzzles', based on the measure 'challenge-seeking: hypothetical scenario' (Yeager et al., 2016) and the idea of Koestner's 'hidden figure puzzles' (Koestner et al., 1995) to measure willingness to seek challenges. The task consists of three puzzles, each presented in an envelope. The envelopes contain respectively an 'easy', 'medium' and 'difficult' puzzle. Participants will be asked to choose a puzzle and answer the question why that specific puzzle is chosen, but participants do not actually complete the puzzle. The choice of challenge level and the reason why that specific puzzle is chosen will be reported by the research assistant.

Impact of social exclusion will be measured by using the 'Cyberball game' (Williams & Jarvis, 2006). In this game, the participant plays two virtual ball-toss games with three others who are presented to be real and connected through a network. The 'others' are in fact controlled by the computer program. In the first game the youth plays a 'normal' tossing ball game and will receive the ball as often as the other players. In the second game it is tested whether the participant will be affected by victimization. After receiving the ball a few times the participant is excluded by the other players and no longer receives the ball during the game. After completing both games, a post experimental questionnaire (Williams et al., 2000) will be assessed. The questionnaire contains 11 statements to measure the impact of the exclusion on belonging ('I feel I belonged

to the group'), mood (e.g., 'How do you feel?'), perception of group cohesiveness (e.g., 'I do not like the other players') and intensity of ostracism (e.g., 'I feel I was being excluded by the other players'). Three questions about meaningful existence, control and self-esteem of the original 12 items questionnaire were deleted. Two new statements served as a manipulation check (e.g., 'The other players are real participants'). The original 9-point answering categories were replaced by a five-point scale with different categories, e.g., 'completely untrue' to 'completely true', 'very bad' to 'very good' and 'very sad' to 'very happy'. Furthermore, the desire for vengeance after exclusion is measured by providing participants the opportunity to take revenge by allocating hot sauce to one of the peers by whom they were excluded during the second Cyberball game. Participants will be told that the other player dislikes spicy food, but has to consume the entire amount of hot sauce anyway. The research assistant will report the amount of allocated hot sauce in grams using a digital weighing scale. Finally, the youth will play the first version of the Cyberball game again.

Participants' safety during data collection for the Cyberball and Hot Sauce paradigms is guaranteed. First, during the experiment the exclusion experience is brief, mild and quickly followed by an inclusion experience. Second, participants will be debriefed immediately after the experiment, following a standardized protocol. Participants will be told the exclusion happened due to a computer error and the players will not have to eat the hot sauce. Furthermore, studies in other special needs populations also obtained ethical permission for this experiment (Sebastian et al., 2009; Vrijhof et al., 2016) and have shown participants did not express regret or distress at having taken part in the Cyberball game (Sebastian et al., 2009; Williams et al., 2000). After debriefing, the participant will have to answer three more questions about their mood to check if they feel relaxed and unthreatened. The Cyberball task takes approximately 10 minutes.

Intervention satisfaction

Participants in the intervention group will grade their satisfaction after each session of "The Growth Factory" with a score from 1 (very low) to 10 (very high). This grading system is in line with the Dutch educational system. The mean of the grades per session will provide a mean session satisfaction grade. Furthermore, the mean of these satisfaction grade scores of the six sessions will be taken to construct an overall mean intervention satisfaction grade. In addition, intervention satisfaction will be measured with a Dutch translation and adaptation of the Session Rating Scale (SRS) (Duncan et al., 2003). Participants will complete four statements, e.g., 'The assistant listened to me today' (relationship), 'What we did today is important to me' (goals and topics), 'I liked what we did today' (approach and method) and 'I hope next time we will do something similar' (overall). The original 10-cm visual analog scale will be replaced by a five point Likert scale ranging from 'completely untrue' to 'completely true'. The average score of the four items will be taken as an indicator of the satisfaction with each session (session SRS). Subsequently, to construct an overall intervention satisfaction score (intervention SRS) the average will be taken of the session satisfaction scores of the six sessions. The scale has demonstrated a satisfactory reliability and validity in previous research (Duncan et al., 2003; Helmond et al., 2022). Finally, participants will be asked to answer two

open questions as a qualitative measure of session satisfaction: 'What did you like about today's session?' and 'What did you not like about today's session?'.

Statistical Analyses

Following the intention-to-treat principle, the data from all participants randomized to either the experimental or control condition will be analysed. Multiple imputations will be used for missing values at post-intervention and follow-up measurements. In addition, a completers only analysis will be conducted (i.e., participants that completed five or six sessions). The results will be reported in accordance with the CONSORT Statement (Schulz et al., 2010).

Possible baseline differences between the two conditions in background variables (e.g., age, gender) and relevant study variables will be examined using independent-sample t-tests. In case of differences at baseline, variables will be included as covariates in all models testing the effectiveness of the intervention. Furthermore, the effectiveness of the intervention will be analysed using repeated measures ANOVA for differences within subjects (i.e., pre-test, post-test, follow-up 1 and follow-up 2 measurements) and between subjects (experimental versus control condition). In addition, intervention satisfaction, level of intellectual disability, age, baseline mindset, and gender will be tested as moderators of the effects of the online mindset intervention.

These moderator effects will be tested using three-way interactions in our repeated measures design. The effect of the mindset intervention on the secondary outcomes measures, (i.e., internalizing problems, attention problems, externalizing problems, and total behavior problems, self-esteem, treatment motivation, therapeutic alliance, challenge seeking, and impact of social exclusion) might be mediated by mindset and empowerment. This will be tested in several mediation analyses in Mplus (Muthén & Muthén, 2007).

Discussion

The present study protocol presents a randomized controlled trial testing the effectiveness of the online mindset intervention "The Growth Factory". The intervention aims to develop a growth mindset in adolescents with intellectual disabilities. A growth mindset leads to higher levels of academic achievement and psychosocial development (Dweck, 1999; Robins & Pals, 2002; Schleider et al., 2015). Therefore, we expect that adolescents in the intervention condition will show larger improvements in their psychosocial development compared with adolescents in the control condition. The primary aim of the present study will be to investigate whether "The Growth Factory" affects the following outcomes: mindset, empowerment, behavior problems, self-esteem, treatment motivation, therapeutic alliance, challenge seeking and impact of social exclusion. The secondary aim will be to examine which factors moderate or mediate the effect of the online intervention "The Growth Factory".

Strengths and Limitations

To our knowledge, this is the first full scale RCT study evaluating an online mindset intervention developed for adolescents with intellectual disabilities. RCT studies are considered the gold standard for evaluating efficacy in clinical research (Spieth et al., 2016). In addition, in contrast to the most RCT studies, we will not only focus on the effectiveness of the program, but also on the moderating and mediating factors of change (i.e., for whom and how the intervention works). Furthermore, the intervention is based on previous effective mindset interventions (Yeager & Dweck, 2012; Yeager et al., 2016) and the core principles of these interventions will remain intact in “The Growth Factory”. Moreover, the intervention is specifically adapted for adolescents with intellectual disabilities using the guidelines for effective interventions for people with intellectual disabilities (De Wit et al., 2011). An additional strength of the study is that the intervention paradigm has been pre-tested in a pilot study to improve the intervention for the target group and to ensure that it fits the information processing needs of these youth with special learning needs (Helmond et al., 2022) Another strength of this study is that different locations of the residential care institute will participate in this study, as will different schools for special education across the country. For this reason, the participants in the current study will represent the diverse population of youth with intellectual disabilities. Furthermore, the triangulation of different data sources (self- and teacher reports, behavioral tasks at the last follow-up) across four measurement moments (pre-test, post-test and a 3 and 6 months follow-up) is a strength.

However, this study also has some limitations. The first is the lack of an additional program specifically developed for teachers and parents as the environment plays a crucial role in facilitating or inhibiting the development of a growth mindset (Ames, 1992; Haimovitz & Dweck, 2016). To diminish this limitation parents were provided with personal login codes to be able to participate in the intervention “The Growth Factory”. Another limitation is that we will not be able to include a third condition that acts like an active control condition to ensure the effects can be uniquely ascribed to the intervention “The Growth Factory”. However, previous research showed that a mindset intervention was more effective than both a passive (no intervention) as well as an active control condition (Aronson et al., 2002). An additional limitation is that the present study, in contrast to many previous studies on mindset interventions, does not measure the impact of “The Growth Factory” on academic achievement. The reason for this is that standardized testing is exceedingly complex in this context—it is not always the standard in special education and varies widely across special education schools. Finally, only short- and medium-term effects (3 and 6 months follow-up) will be investigated. In this way, no conclusions can be drawn about the longer-term effects of “The Growth Factory” on the psychosocial development of youth with intellectual disabilities.

Implications for Practice

If “The Growth Factory” proves to be effective, a significant contribution to the evidence-based treatment of empowerment in adolescents with intellectual disabilities will be provided. When adolescents with intellectual disabilities believe in the malleability of their capabilities and therefore experience more control over their own lives and will

improve their psychosocial outcomes. Furthermore, due to the online approach, dissemination and implementation of the intervention will be efficient and cost-effective and therefore the intervention “The Growth Factory” will be able to be used on large scale in residential care institutes and at special schools.

Conclusion

Adolescents with intellectual disabilities are more likely to endorse a fixed mindset compared to their non-disabled peers. Mindset interventions can have positive impact on the academic achievements and psychosocial development of adolescents. This paper describes the design of an effectiveness study of the online intervention “The Growth Factory” developed to empower adolescents with intellectual disabilities by teaching a growth mindset. In addition, with this study we will also contribute to a further understanding of possible moderating and mediating effects of mindset interventions. By doing so we gain more insight into what works for whom and how it works when it comes to interventions aiming to develop a growth mindset. Furthermore, this is the first study evaluating an online mindset intervention specifically adapted to adolescents with intellectual disabilities. If “The Growth Factory” turns out to be effective, a significant contribution will be made to the evidence-based treatment empowering adolescents with intellectual disabilities.

Chapter 5

Satisfaction and clinical effects of the online mindset intervention The Growth Factory

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Abstract

Background

This study examines participant satisfaction and effectiveness of the online mindset intervention “The Growth Factory” (TGF) for youth with intellectual disabilities using a RCT design.

Method

Youth with mild to borderline intellectual disabilities ($N = 119$; 12–23 years) were randomly assigned to TGF ($n = 60$) or control group ($n = 59$). Primary outcome measures were mindsets and perseverance. Secondary outcomes were empowerment, mental health problems, self-esteem, treatment motivation, therapeutic alliance, and challenge seeking. Measurements were conducted at pre-test, post-test, and at 3 and 6 months follow-up.

Results

TGF had positive effects on perseverance, mental health problems, self-esteem, and therapeutic alliance at post-test. TGF had follow-up effects on mental health problems (3 months), mindset of intelligence (3 and 6 months), and mindset of emotion and behaviour (6 months).

Conclusions

TGF offers a promising add-on intervention complementing usual care programs accelerating improvements in mindsets and mental health in youth with intellectual disabilities.

Introduction

It is well-recognised that youth with intellectual disabilities face a greater risk of co-morbid physical and mental health problems than typically developing peers, such as internalising and externalising problems, and a broad range of psychiatric diagnoses (e.g., Dekker & Koot, 2003; Munir, 2016). In addition, youth with intellectual disabilities are more likely to endorse a fixed mindset—the core assumption that personal attributes such as emotions, behaviours, and intelligence are static and uncontrollable—compared to peers without intellectual disabilities (Baird et al., 2009; Koestner et al., 1995; Verberg et al., 2019). This fixed mindset could be a risk factor hindering positive psychosocial development (Burnette et al., 2020; Schleider et al., 2015). Interventions aimed at the mindset of youth without intellectual disabilities were often found to effectively stimulate a growth mindset which subsequently, positively impacted adolescents' academic and psychosocial functioning (Schleider & Weisz, 2016b, 2018; Yeager et al., 2013, 2019). Unfortunately, despite the fact that youth with intellectual disabilities are more likely to experience mental health problems and to endorse a fixed mindset, full scale mindset intervention programs tailored for adolescents with intellectual disabilities and research examining their effectiveness are non-existing. Therefore, we developed the online mindset intervention The Growth Factory (TGF) for youth with intellectual disabilities with the aim to stimulate growth mindset and thereby contributing to prevent and reduce mental health problems. The aim of the present study is to evaluate and investigate the participant satisfaction and effectiveness of TGF in youth with intellectual disabilities using a randomised controlled trial (RCT) on primary outcomes (mindset and perseverance) and secondary outcomes (empowerment, mental health problems, self-esteem, treatment motivation, therapeutic alliance, challenge seeking).

Mindset theory and psychosocial outcomes

Building on a long tradition in psychology, Carol Dweck introduced the mindset theory as a way to understand the effects of personal beliefs on human behaviour (Dweck, 2000, Dweck & Leggett, 1988). Mindset provides a lens through which people ascribe meaning to events, and this affects how they interpret and respond to situations in all aspects of their lives, but particularly under conditions of challenge and setbacks (Blackwell et al., 2007). Along a continuous dimension and different across domains, people can range from a fixed mindset, beliefs that personal attributes are innate and uncontrollable, to a growth mindset, beliefs that these attributes are dynamic and can be developed over time (Dweck, 2000).

Previous research has shown one's mindset is related to an array of self-regulatory processes in terms of attributions and reactions to effort, failure, and challenges, henceforth referred to as perseverance. In particular, when people believe they are capable of change they will be more eager to learn, put in effort to improve abilities and reverse setbacks, attribute failure to a lack of effort, and embrace challenges as opportunities to grow compared to people with fixed beliefs (Blackwell et al., 2007; Dweck, 2006; Dweck & Leggett, 1988).

Subsequently, mindset and perseverance have shown to predict motivation and (academic) performance (Burnette et al., 2013; Mrazek et al., 2018). In recent years, considerable evidence has accumulated to indicate the distinct advantage of a growth mindset in the mental health domain by buffering against psychological distress and mental health problems such as stress and low self-esteem (Schleider et al., 2015; Schroder et al., 2015). For example, a meta-analysis on 17 studies revealed that youth with a fixed-oriented mindset were more likely to experience internalizing and externalizing problems compared to youth with a growth-oriented mindset (Schleider et al., 2015). Although research on mindsets and their associations with psychosocial development has burgeoned, the growth mindset concept is almost unexplored among people with intellectual disabilities.

To our best knowledge, only three studies have investigated the mindset of youth with intellectual disabilities. Results indicated that they were more likely to endorse a fixed mindset compared to peers without intellectual disabilities (Baird et al., 2009; Koestner et al., 1995; Verberg et al., 2019). In particular, results from a Canadian study indicated that youth with intellectual disabilities ($n = 45$, 7th and 8th grade, IQ 55–75) were more likely to attribute failure to a lack of ability rather than to a lack of effort compared to 43 youth without intellectual disabilities (Koestner et al., 1995). The authors (1995) interpreted the different attributional styles for failure as evidence for either a growth or fixed mindset of intelligence. Furthermore, 107 students with learning disabilities (i.e., receiving special education services for their learning disabilities) were more likely to endorse a fixed mindset of intelligence compared to 1411 typically developing peers ($M = 14.4$, age range 10–19 years; Baird et al., 2009). In addition, our study did not find differences with regard to a mindset of intelligence between youth with ($n = 247$, $M_{age} = 15.48$ years, $SD = 1.82$, $M_{IQ} = 69$, range 50–85) and without intellectual disabilities ($n = 96$, $M = 14.68$ years, $SD = 1.36$), but participants with intellectual disabilities were more likely to endorse a fixed mindset of emotion and behaviour (Verberg et al., 2019). Moreover, regarding to perseverance previous research showed that when confronted with challenging tasks, youth with intellectual disabilities were more likely to demonstrate and prove their ability rather than increase their abilities, and interpreted putting in effort as evidence of limited ability compared to peers without intellectual disabilities (Baird et al., 2009). Finally, research showed that a more growth-oriented mindset of emotion and behaviour was related to higher levels of empowerment, self-esteem, and mental health (Verberg et al., 2019). In sum, although differences in measurement, procedure and participants in previous mindset studies among youth with intellectual disabilities, the above-mentioned findings suggest that teaching youth with intellectual disabilities a growth mindset might help to stimulate perseverance and improve psychosocial development, more specifically empowerment, self-esteem, and mental health.

Mindset interventions

Previous research has demonstrated that a growth mindset can be stimulated with experimental mindset manipulations and interventions among youth without intellectual disabilities (e.g., Schleider & Weisz, 2016b; Yeager et al., 2013). These brief psychologi-

cal interventions are based upon the core principle that one's characteristics have the potential to change through effort and practice (Dweck, 2000). In particular, a mindset intervention emphasises the concept of brain plasticity and promotes the idea that people themselves are in charge of this process (e.g., Yeager et al., 2016). For example, the role of effort in learning, switching and trying new strategies, and seeking for and accepting help are taught. Moreover, to help reinforce and internalise the information, successful role models of a growth mindset and persuasive techniques are often used, such as "saying-is-believing" exercises in which participants are asked to formalise the material in their own words and write to others, advocating the growth mindset message (Yeager & Walton, 2011).

Research has demonstrated that mindset interventions generally find the predicted effects on mindset and perseverance among adolescents without intellectual disabilities (e.g., Burgoyne et al., 2018; Mrazek et al., 2018; Schleider & Weisz, 2016b, 2018; Yeager et al., 2016, 2019). Furthermore, mindset interventions have also shown effects, though less consistently, on empowerment, mental health problems, and self-esteem (Burnette et al., 2020; Miu & Yeager, 2015; Schleider & Weisz, 2016b, 2018; Yeager et al., 2013). For example, a randomised controlled growth mindset intervention among 96 youth ($M_{age} = 13.32$ years, $SD = 1.14$, age range 12–15 years) increased feelings of empowerment among participants assigned to the intervention group ($n = 48$) compared with control participants ($n = 48$; Schleider & Weisz, 2016b). Moreover, the potential impact of mindset interventions on motivation and therapeutic alliance is of clinical relevance since these factors play an important role in enhancing treatment outcomes (Shirk & Saiz, 1992). For example, research showed that an intervention including a growth mindset component improved treatment amenability in youth with conduct problems (Salekin et al., 2012). In addition, a mindset manipulation—indirectly—helped youths to build more positive relationships with family, friends, and co-workers (Van Tongeren & Burnette, 2018). Despite these promising findings of mindset interventions recently some inconsistent or non-significant findings on academic and mental health outcomes have been reported as well (Calvete et al., 2019; Foliano et al., 2019; Sisk et al., 2018). The question arises whether youth with intellectual disabilities can also benefit from a mindset intervention by learning that their attributes are malleable and thereby positively impacting their psychosocial functioning. Therefore, we developed the online mindset intervention TGF specifically for youth with intellectual disabilities.

The present study

The main objective in this RCT was to test the effectiveness of the online mindset intervention TGF among youth with intellectual disabilities. In this study, we hypothesised that TGF would increase a growth mindset of emotion and behaviour, a growth mindset of intelligence, and perseverance (primary outcomes). In addition, we hypothesised that TGF would increase psychosocial functioning of youth with intellectual disabilities, including empowerment, mental health, self-esteem, and challenge seeking, as well as more common treatment factors treatment motivation, and therapeutic alliance (secondary outcomes). TGF intervention effects were tested directly after the intervention and at 3 and 6 months follow-up.

Method

Participants

Participants were recruited from a residential care institution and six special education schools for youth with intellectual disabilities and comorbid physical and/or psychiatric problems in the Netherlands. Data collection took place in five rounds between October 2015 and 2017.

In total 124 youth were included in the present study, but five participants dropped out before the pre-test. One participant showed resistance before start and four participants were unable to fill in the questionnaires due to their intellectual disability. The final sample consisted of 119 participants with a mean age of 15.83 years (range 12–23), and an average intelligence score of 66.41 (range 50–85). In addition to an intellectual disability, the majority of the participants (92.4%) were diagnosed with comorbid problems including a physical disability (e.g., cerebral palsy, spina bifida), psychiatric disorder (e.g., attention deficit hyperactivity disorder) or both (see Table 1).

Table 1

Participants' Characteristics and Group Differences at Pre-Test

	Intervention (n = 60)		Control (n = 59)		Total (N = 119)		Statistics
	n	%	n	%	n	%	
Gender							$t(117) = -.08, p = .94$
Male	35	58.3	34	57.6	69	58	
Female	25	41.7	25	42.4	50	42	
TIQ – M (SD)	66.9	(10.03)	65.9	(9.08)	66.4	(9.54)	$t(117) = -.56, p = .58$
Age – M (SD)	15.9	(2.25)	15.8	(2.22)	15.8	(2.23)	$t(117) = -.38, p = .70$
Age groups							$t(117) = -.34, p = .74$
Early ad (<15 yrs)	22	36.7	24	40.7	46	38.7	
Mid-late ad (>15 yrs)	38	63.3	35	59.3	73	61.3	
Level of ID							$t(117) = -.34, p = .74$
Mild ID	41	68.3	42	71.2	83	69.7	
Borderline IF	19	31.7	17	28.8	36	30.3	
Comorbidity	53	88.3	57	96.6	110	92.4	
Physical disability	36	67.9	41	71.9	77	70.0	$t(117) = .43, p = .67$
Psychiatric problem	5	9.4	8	14.0	13	11.8	$t(117) = -.15, p = .88$
Multiple	12	22.6	8	14.0	20	18.2	$t(117) = -.94, p = .35$

Note. Ad = adolescence; yrs = years; ID = intellectual disability; IF = intellectual functioning.

Attrition was low with 14 (11.8%) participants dropping out of the study after the pre-test. These participants dropped out because they showed resistance or due to other reasons (i.e., absence, overburdening, and acute and severe problems). In addition, one participant completed all measurements, but did not start the challenge seeking task due to time constraints. Participant flow is shown in Figure 1. We found a significant difference between participants who concluded all measurements ($n = 105$) and dropouts (less than four measurements; $n = 14$) in pre-test score of perseverance ($t(117) = 2.81$, $p = .006$). Dropouts scored significantly lower ($M = 3.43$, $SD = 0.81$) on perseverance than completers ($M = 3.86$, $SD = 0.50$). No other statistical differences between completers and dropouts were found.

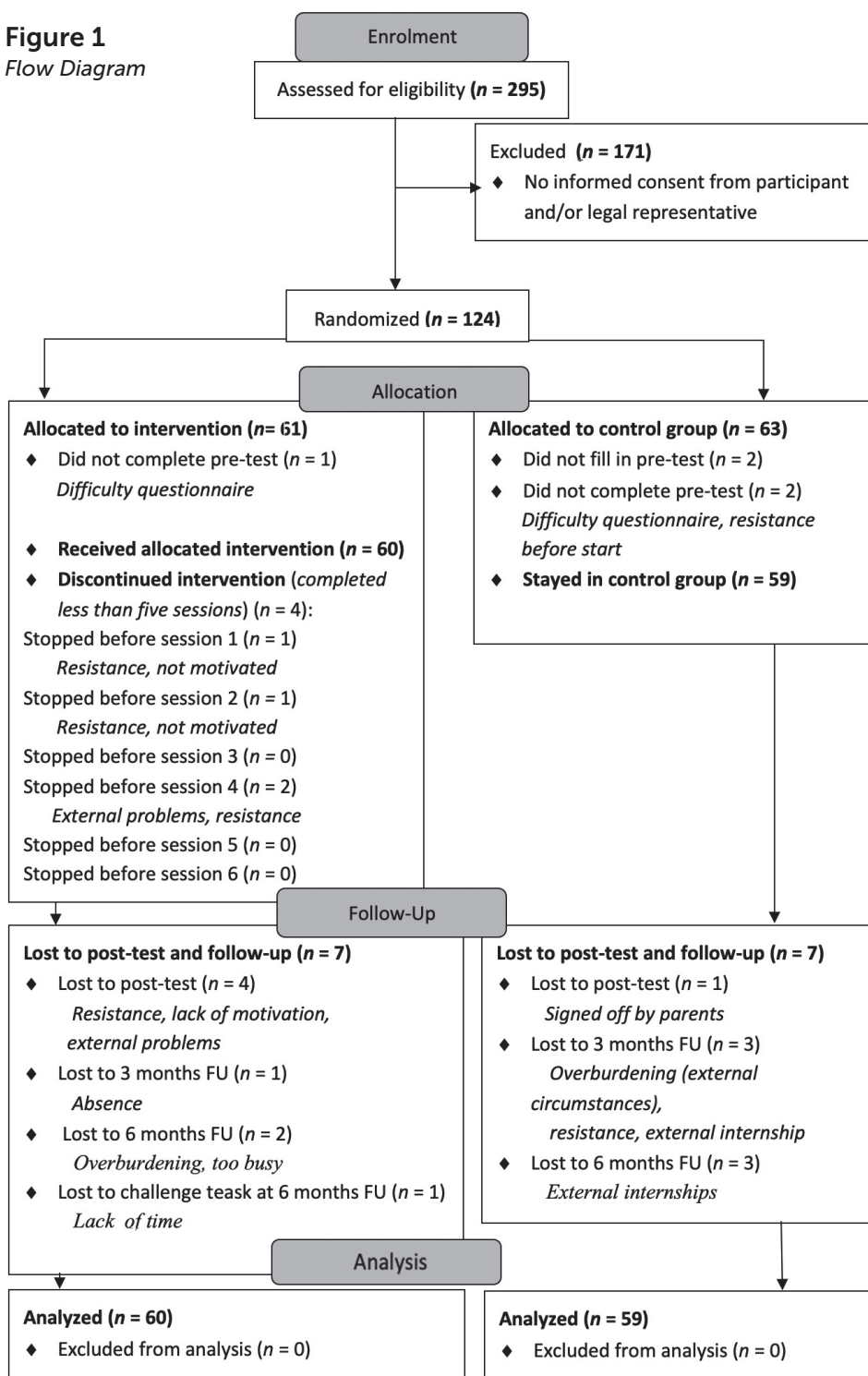
Procedure

Participants were recruited by treatment coordinators of the institute and the school psychologists. Inclusion criteria were youth between 12 and 23 years old having an IQ score within the mild (IQ 50–69) or borderline (IQ 70–85) intellectual disabilities range and comorbid physical disabilities and/or psychiatric problems. Exclusion criteria were severe and acute mental health problems hindering participation in the study. After the selection process, legal representatives of all potential participants received an information letter containing a digital link and response letter for written consent. Next, youth were informed before the first screening by two research assistants in their classroom or group. Participants were guaranteed anonymity and it was explained that they could stop the study at any time. Adolescents and legal representatives who met the inclusion criteria and signed the informed consent form were included in the study. Participants were informed about the allocation to the intervention or control group by their mentor, whereas caregivers and mentors received an email.

Questionnaire assessments were conducted at four time points: pre-test (prior to the intervention), post-test (within two weeks after the intervention), and a follow-up at 3 and 6 months after the intervention. In addition, at 6 months follow-up, we assessed the impact on challenge seeking using the 'puzzle task'. All questionnaire assessments were completed on a computer and guided individually by a trained research assistant in a quiet room. Research assistants read all questions aloud, checked participants understanding, used standardised clarification and provided help if needed. After each assessment, the assistant wrote important observations on a checklist. On average, assessments took 25–35 minutes, whereas the shorter 3 months follow-up lasted 20 minutes. All research assistants had a bachelor or master degree. They attended four 2-hour training sessions to learn about the theoretical background and design of the study, and to practice TGF training skills and discuss and evaluate experiences. In addition, we collected mentor-reports about youths' mindset and perseverance, empowerment, and mental health problems at pre-test and 3 and 6 months follow-up. Mentor assessments were, however, not analysed due to a lack of statistical power (Verberg et al., 2018).

To thank youth for participating in the study, they received a 'brain stressball' and 'thumbs-up flashlight' after completing the first and second follow-up assessment.

Figure 1
Flow Diagram



Moreover, all participants in the control group were given the opportunity to participate in the sessions of TGF after the data collection had finished.

Intervention The Growth Factory

TGF is an online intervention that aims to empower adolescents with intellectual disabilities by fostering a growth mindset. TGF builds on scientific research on implicit self-theories and mindset interventions by Carol Dweck and David Yeager (Dweck, 2000; Yeager et al., 2013, 2016). The six sessions of TGF contain information and interactive assignments developed around the core principle of the mindset theory, that is the (implicit) assumption that one's characteristics are malleable. It teaches youth the key growth mindset affirmations by showing the potential for brain plasticity and promoting the 'recipe for growth', the idea that exerting effort and persisting despite setbacks and challenges, finding good strategies, and asking for and making use of help from others will help them to improve (Paunesku et al., 2015). In addition, three sessions contain exercises based on the principles of cognitive behavioural therapy. Youth practise recognizing negative thoughts and changing these thoughts into so called 'growth thoughts', and asking for help in a role-play. Moreover, based on knowledge about components that can enhance the effects of mindset interventions (Yeager et al., 2016), we added a successful role model component—in addition to a focus on change mindset messages combined with "saying-is-believing" exercises. In particular, movie clips of peers telling about how a growth mindset was helpful in overcoming problems and reaching their goals, are shown each time accompanied by an assignment. For an outline of the content of the intervention see the Appendix.

The intervention is tailored for adolescents with intellectual disabilities by adapting all received mindset materials with a team of professionals and youth with intellectual disabilities using the guidelines for effective interventions for people with intellectual disabilities (De Wit et al., 2011). Purposefully, in developing TGF, we showed youth with intellectual disabilities prototypes of growth mindset materials and integrated their feedback, increasing the likelihood that the targeted population would understand the intended meaning (Yeager et al., 2016). Moreover, special care was taken to increase the likelihood that participants would identify with one of the avatars or 'buddies', by creating avatars with different characteristics and by creating role models in the video-clips whose stories and struggles matched those oftentimes reported by youth with intellectual disabilities and professionals (Binning et al., 2018; Yeager & Walton, 2011).

Additionally, youth were allowed to personalise their responses (e.g., by choosing their own topic in an assignment) so intervention materials evoked the intended experience in the way that was most relevant to them (Yeager & Walton, 2011). Moreover, by choosing an online approach we were able to meet the information processing needs of youth with intellectual disabilities, such as using visual and auditory support, and to provide a structured learning environment with the possibility to repeat parts or making use of extra advice. To improve the transfer from TGF into daily life, biweekly mails and mobile phone messages were sent containing a reminder of the session's content or a

short assignment. Finally, based on the pilot study (Helmond et al., 2022) a workbook and several additional assignments were added to practise with the research assistant. Homework assignments were discussed before start of the next session. For a detailed description of the development, structure, and content of TGF, see the previously published study protocol (Verberg et al., 2018).

Intervention and control group

After pre-test, youth in the intervention group participated individually in six sessions of TGF as an addition to their usual care program. For six consecutive weeks, youth participated in a session lasting 25 to 40 minutes on average. In addition, participants received a booster session directly after the 3 months follow-up. Sessions took place in a silent room during school or day care hours under guidance of a research assistant using a standardised protocol. Participants received a small gift after completing session five and six. Parents were offered an account to be able to follow the sessions at home.

Participants assigned to the control group attended the school curriculum or care as usual as recommended by their clinicians regardless of this study. Some participants received additional therapies depending on specific developmental needs, such as resilience training, physiotherapy, and creative arts therapies. In both settings, a multidisciplinary team of a (group)mentor, psychologist, therapist(s) and sometimes a social worker and psychiatrist were involved.

Materials

Instruments were adjusted to reduce complexity using the guideline for developing, adjusting and conducting diagnostic instruments for people with intellectual disabilities (Douma et al., 2012). As another means to reduce complexity, we used one format of answering categories ranging from 'completely untrue' to 'completely true' and added corresponding coloured emoticons. Moreover, we simplified or rephrased² difficult words to avoid misunderstandings. Our previous studies showed the questionnaires to be suitable for youth with mild to borderline intellectual disabilities and/or psychiatric problems) and all instruments showed sufficient to good reliabilities (Helmond et al., 2022; Verberg et al., 2019). For internal reliabilities in the present study, see Table 2.

Measures

Mindset and perseverance

Beliefs about the malleability of emotion and behaviour and intelligence, and participants' perseverance were assessed using the Mindset and Perseverance Questionnaire (MPQ; Verberg et al., 2019). The MPQ consists of two parts measuring mindset of emotion and behaviour and mindset of intelligence (9 items, e.g., 'I can learn to control how I feel' and 'How smart I am is sort of fixed'), and adolescent's self-regulatory processes (i.e., attributions and responses to effort, failure, and challenges, 9 items). An example of this subscale is 'Practising a lot is useless'. Items were scored on a 5-point Likert scale and all fixed mindset statements were reverse-scored such that higher scores indicate a growth mindset and more perseverance.

² For a complete overview see [Verberg et al., 2019].

Empowerment

Empowerment was measured with the Dutch questionnaire 'EMPO Jongeren 2.0' (EMPO Youth 2.0; Damen & Veerman, 1995). The EMPO Youth 2.0 consists of 16 items divided over the subscale 'intrapersonal empowerment' (9 items) measuring one's personal sense of control, competence, and efficacy regarding dealing with important matters and the subscale 'interactional empowerment' (7 items), measuring the alertness and willingness to change undesired situations by taking control, looking for solutions, and call upon resources (Damen et al., 2017). A total empowerment score was calculated by summing up the two subscales. Items were scored on a 5-point Likert scale. Higher scores indicate stronger feelings of empowerment.

Mental health problems

We assessed mental health problems using the Dutch version of the Brief Problem Monitor-Youth (BPM-Y; Achenbach et al., 2011; Verhulst & Van der Ende, 2013). The BPM-Y contains 19 items measuring internalizing problems (6 items), externalizing problems (7 items), and attention problems (6 items) with three answering categories. The sum of the items yields a total problem score.

Self-esteem

Self-esteem was measured using the Dutch Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Franck et al., 2008). This is a 10-item Likert self-report scale with positive and negative evaluations answered on a 4-point scale. Higher scores indicate a stronger sense of self-esteem.

Treatment motivation

Treatment motivation was measured with the Dutch translation of the Motivation for Youth's Treatment Scale (MYTS; Breda & Riemer, 2012). The scale used in the current study consists of 7 items answered on a 5-point Likert scale. One item was omitted from the original questionnaire because not all youth received treatment or planned to receive treatment. The items are divided over two subscales measuring problem recognition (4 items) and treatment readiness (3 items). The sum of these items yields a total motivation score.

Therapeutic alliance

Alliance was measured with the Dutch translation of the Therapeutic Alliance Scale for Children, revised (TASC-r; Shirk & Saiz, 1992). The instrument distinguishes between the affective bond (6 items) and client-therapist collaboration (6 items). The word 'therapist' was reformulated into 'mentor' to better fit the target group. The original items rated on a 4-point Likert scale were changed into 5-point answering categories to match the answering categories of most other measures used.

Challenge seeking

The willingness to seek challenges was assessed at 6 months follow-up by registering youth's choice of one of three puzzles using the experimental task 'puzzles'. This task was based on the measure 'challenge-seeking: hypothetical scenario' (Yeager et al.,

Table 2*Internal Reliabilities for the Outcome Variables in Youth with Intellectual Disabilities*

Measures	Cronbach's alpha			
	Pre-test	Post-test	Follow-up 1	Follow-up 2
Mindset				
Mindset EB	.61	.56	.60	.57
Mindset IQ	.68	.71	.72	.75
Perseverance	.74	.73	.82	.78
Empowerment				
Total	.81	.84	.84	.85
Intrapersonal	.77	.80	.80	.80
Interactional	.60	.65	.71	.76
Mental health problems				
Total	.85	.87	.85	.86
Internalising	.76	.78	.74	.69
Externalising	.73	.73	.74	.78
Attention	.77	.77	.78	.77
Self-esteem	.82	.82	-	.79
Treatment motivation				
Total	.85	.84	-	.83
Problem recognition	.79	.80	-	.85
Treatment readiness	.83	.81	-	.80
Therapeutic Alliance				
Total	.84	.82	-	.83
Collaboration	.65	.63	-	.68
Affective Bond	.80	.76	-	.72

Note. EB = emotion and behaviour.

2016) and 'hidden figure puzzles' (Koestner et al., 1995). Participants were presented with three envelopes containing three puzzles with different challenge levels (0 = 'easy', 1 = 'middle', and 2 = 'difficult') and asked to choose one of them. The choice of challenge level and the reason why that specific puzzle was chosen were reported by the research assistant. Participants did not need to complete the puzzle.

Intervention satisfaction

At the end of each session, participants in the intervention group were asked to grade their satisfaction with a score from 1 (very low) to 10 (very high). The mean of the satisfaction grade scores of the six sessions was taken to construct an overall mean intervention satisfaction grade. In addition, participants were asked to complete four statements of the Dutch translation and adaptation of the Session Rating Scale (SRS, Duncan et al., 2003): 'The assistant listened to me today' (relationship), 'What we did today is important to me' (goals and topics), 'I liked what we did today' (approach and method) and 'I hope next time we will do something similar' (overall). The original 10-cm visual analogue scale was replaced by a 5-point Likert scale. The mean score of these items was taken as an indicator of the satisfaction with each session (session SRS). The mean was taken of the session satisfaction scores of the six sessions. Finally, participants answered two open questions as a qualitative measure of session satisfaction: 'What did you like about today's session?' and 'What did you not like about today's session?'.

Statistical analyses

To assess possible differences at pre-test in background variables and study outcome variables between the two groups, we used independent-sample *t*-tests and chi-square tests (see Table 1). Quantitative and qualitative analyses were carried out to provide insight into participants' satisfaction with the intervention. For the quantitative analyses we reported descriptive statistics of the satisfaction grades and SRS scores given at the end of each session. For the qualitative analyses, we categorised participants' responses on the two open questions into specific themes.

To examine intervention effectiveness, after performing preliminary ANOVA analyses, we performed linear regression models using Mplus Version 7 (Muthén & Muthén, 1998-2012). We determined immediate post-test effects (i.e., changes from pre-test to post-test), and follow-up effects (i.e., changes from pre-test to follow-up at 3 and 6 months, respectively) between the intervention and control group for primary and secondary outcome variables. In each of the analyses we controlled for earlier test scores. On top of that we controlled for sex, age, and total IQ. To handle missing data, we used the WLSMV, which is a robust estimator which does not assume normally distributed variables (Brown, 2006). The WLSMV uses pairwise present for missing (Muthén & Muthén, 1998-2012). In total, we assessed 45 separate outcome measures in the full intention-to-treat analyses. The 'CLUSTER' command was used to take in account the non-independence of data due to children receiving school or care at different treatment locations which could otherwise artificially inflate the standard errors of the parameter estimates. As a consequence, we used the MLR-estimator. MLR (Maximum likelihood with robust standard errors) takes clustering of cases into account and es-

estimates with standard errors and a chi-square test statistic (when applicable) that are robust to non-normality and non-independence of observations when used with 'TYPE = COMPLEX'. Finally, the Benjamini-Hochberg false discovery rate correction was used to correct for chance capitalization (Benjamini & Hochberg, 2005). The p values after this correction are presented in Section 3.

Furthermore, we performed paired sample t -tests to analyse the mean level differences over time in the control and intervention groups. Data were analysed in accordance with the intention-to-treat principle (i.e., all participants regardless the number of completed sessions). In addition, a completers-only analysis was conducted (i.e., only participants who completed five or six sessions ($n = 56$)). Magnitude of intervention effects between groups were estimated using Cohen's d (Cohen, 1988). The analyses were reported in accordance with the CONSORT Statement (Schulz et al., 2011).

Results

Preliminary analyses

There were no potential outliers that influenced the outcomes. Intention to treat and completers-only analyses yielded the same results, therefore only intention to treat analyses are presented. At pre-test, we found no significant differences between the intervention and control group concerning age, gender, IQ, and comorbidity (all $p > .10$, see Table 1). In addition, no significant differences appeared in the pre-test scores of study outcome variables (all $p > .10$). The intervention and control group were thus successfully randomised.

Intervention satisfaction

Intervention satisfaction scores on both quantitative measures indicated an overall positive evaluation of TGF. In particular, participants rated TGF with a mean intervention grade of 7.5 ($SD = 1.53$, range 1–10), and a mean overall intervention SRS score of 3.8 ($SD = 0.72$, range 1–5). In addition, to explore participants' satisfaction with the newly developed TGF, we categorised participants' answers on two open questions. Overall, participants' responses to 'What did you like about today's session?' reflected on participants' feelings of competence (*'I think that I am more confident now and learned how to deal with others'*) and *'Interesting, that by learning new things, connections [in my brain] multiply'*), entertainment value (*'Nice, especially the stories in the video clips'*), design (*'That you could fill things in'*), level (*'It was clear'*), and a non-specific positive evaluation (*'Everything'*). In contrast, responses on the question 'What did you not like about today's session?' mainly reflected on the design of the intervention (*'The repetitions were boring'*), level (*'It was hard'* and *'A little bit too easy'*), entertainment value (*'That I was almost sleeping'*), technical errors (*'Problems with the video clips'*), and a non-specific negative evaluation (*'Everything'*). However, approximately 40% of all responses on this question referred to the category 'nothing', indicating participants evaluated the intervention positively (*'Nothing, I liked it!'*).

Intervention effectiveness

Immediate post-test intervention effects

We tested the immediate effectiveness of TGF on mindset of emotion and behaviour, mindset of intelligence, and perseverance at post-test (see Tables 3 and 4). There were no significant differences between the intervention and control group in mindset of emotion and behaviour and mindset of intelligence ($p > .05$). However, there was a significant immediate post-test effect of TGF on perseverance ($d = 0.43$).

In addition, we tested the immediate post-test effects of TGF on the secondary outcomes empowerment, mental health problems, self-esteem, treatment motivation, therapeutic alliance, and challenge seeking (see Tables 3 and 4). We found significant immediate post-test effects on internalizing ($d = -0.39$), attention ($d = -0.40$), and total mental health problems ($d = -0.38$). In addition, there was a significant immediate post-test effect on TGF on self-esteem ($d = 0.08$). Finally, we found a significant immediate post-test effect on collaboration with the mentor (i.e., subscale of therapeutic alliance; $d = .26$). No direct effects of TGF were found on empowerment, externalizing problems, treatment motivation, therapeutic alliance (i.e., affective bond and total), and challenge seeking ($p > .05$). Overall, we found that TGF was effective in increasing perseverance and self-esteem, in decreasing internalizing, attention, and total mental health problems, and in maintaining participants' collaboration with their mentor immediately after the intervention.

Follow-up intervention effects

Furthermore, we explored whether the intervention showed effects at follow-up, and whether immediate post-test intervention effects sustained over time (see Tables 3 and 4). With regard to the primary outcomes, additional analyses revealed that there was a significant effect of TGF on mindset of intelligence at 3 months follow-up ($d = 0.26$), which sustained at 6 months follow-up ($d = 0.30$). In addition, at 6 months follow-up, there was a significant effect on mindset of emotion and behaviour ($d = 0.02$). However, regarding perseverance, the difference at post-test between the intervention and control group was no longer significant at 3 and 6 months follow-up.

In addition, with regard to the secondary outcomes, TGF had sustained effects at 3 months follow-up on internalizing ($d = -0.47$), attention ($d = -0.38$), and total ($d = -0.44$) mental health problems, but not at 6 months follow-up. This seemed to be due to the fact that the control group showed a steep decrease in mental health problems from pre-test to 6 months follow-up. Regarding collaboration, the difference at post-test between the intervention and control group was no longer significant at 6 months follow-up. No sleeper effects—effects that only become visible at a follow-up assessment—of TGF were found on empowerment, externalizing problems, treatment motivation, therapeutic alliance (i.e., affective bond and total) at 3 and 6 months follow-up, nor on challenge seeking at 6 months follow-up ($p > .05$). In sum, TGF had follow-up effects in increasing mindset of intelligence (3 and 6 months) and mindset of emotion and behaviour (6 months). In addition, TGF had sustained effects in decreasing internalizing, attention, and total mental health problems until 3 months after the intervention,

but at 6 months follow-up these effects did not sustain due to improvements in the control group.

Discussion

This study demonstrated that participants were satisfied with The Growth Factory (TGF) intervention, as indicated by positive scores and comments on both quantitative and qualitative satisfaction measures. TGF was effective in increasing perseverance and self-esteem, decreasing internalizing, attention, and total mental health problems, and neutralizing a decrease in participants' collaboration with their mentor at post-intervention. The effects on mental health problems sustained at 3, but not at 6 months follow-up due to improvements in the control group. Furthermore, TGF had follow-up effects on mindset of intelligence at 3 and 6 months, and mindset of emotion and behaviour at 6 months after the intervention. TGF did not have significant effects on empowerment, externalizing problems, treatment motivation, therapeutic alliance (i.e., affective bond and total), and challenge seeking.

Our findings are in line with previous research on the effects of mindset interventions for youth without intellectual disabilities, indicating that mindset interventions can be effective for youth with intellectual disabilities (e.g., Burnette et al., 2020; Miu & Yeager, 2015; Mrazek et al., 2018). The intervention effects are particularly important for our target group of youth with intellectual disabilities, as their mental health needs are multiple, complex and persistent, and often inadequately met (Kolaitis, 2008). Additionally, our findings extend previous research indicating a positive impact on the therapeutic relationship in a special education or care setting. This suggests that TGF is a promising approach to maintain a positive alliance between youth with intellectual disabilities and their mentor, which may subsequently enhance treatment outcomes (Shirk & Saiz, 1992).

In contrast to previous intervention studies our study did not show that TGF was effective in increasing growth mindsets immediately after the intervention (e.g., Paunesku et al., 2015; Yeager et al., 2016), however, the most interesting results are the effects on mindsets at 3 (intelligence) and 6 months (intelligence and emotion and behaviour) follow-up. The null effects on mindsets immediately after the intervention support the hypothesis that because mindsets tend to be deeply held (Robins & Pals, 2002) and thinking, processing information, and learning occur at a slower rate in people with intellectual disabilities, mindset effects need more time to be internalised by this population leading to gradually increased intervention effects over time, the so-called sleeper-effect (Van Aar et al., 2017). Moreover, previous research demonstrated the alternate possibility that mental health problems may also predict increases in fixed mindsets (Schleider & Weisz, 2016a). Therefore, it may be possible that the immediate, as well as sustained effects of TGF on decreasing mental health problems may have contributed to the development of increasing growth mindsets at follow-up. It is noteworthy that the 6 months follow-up effects on mindset of emotion and behaviour

only had a very small effect ($d = 0.016$), however, due to scarce literature on long-term mindset effects after 4 months follow-up it is largely unknown how initial null-effects or modest positive effects develop overtime after a mindset intervention.

In line with the few available studies on long-term outcomes of mindset interventions, TGF effects were sustained until 3 months follow-up, suggesting that TGF had a short to midterm effect. However, it should be taken into consideration that the null effects at 6 months follow-up were not driven by an increase in mental health problems in the intervention group, but driven by a remarkable decrease in mental health problems in the control group at 6 months follow-up. Research investigating the effectiveness of institutional general care suggests that mental health problems tend to weaken during care (Geurts et al., 2010; Knorth et al., 2008), therefore the present results suggest that TGF may have accelerated this normative development in a special education or care setting.

While previous research showed mindset interventions might be effective in decreasing externalizing problems, increasing empowerment, improving challenge seeking and treatment motivation, our results demonstrated null-effects on these outcome variables (e.g., Miu & Yeager, 2015; Schleider & Weisz, 2016b). One potential reason for this is that the effect of shifting mindsets was not strong enough to lead to downstream changes in feelings of empowerment and treatment motivation (Burnette et al., 2018). Another potential explanation could be the focus of TGF, which was aimed at promoting a growth mindset and perseverance and also explicitly addressing the potential beneficial effects on emotions and behaviours, but not on the other outcomes (Burnette et al., 2018). Finally, despite individual reports on successful mindset interventions, and apart from the initial results of the meta-analysis of Burnette and colleagues (2020), it is noteworthy that a recent meta-analysis (Sisk et al., 2018) of experimental effects (29 studies, 43 effects; $N = 57,155$) demonstrated that mindset interventions overall only have a very small effect ($d = 0.08$)—although it is hard to make direct comparisons as the majority of these interventions focussed on academic achievement.

Strengths and Limitations

Several limitations of this study need to be considered. One is that our findings are based exclusively on participants' self-reports. Due to a lack of statistical power for the mentor-reports these data could not be analysed. Another limitation is that we did not measure the impact of TGF on academic achievement. The reason for this is that standardised testing is exceedingly complex in this context—it is not always the standard in special education. Moreover, extended follow-up data are needed to draw conclusions on intervention effects in the long-run. Additionally, the subscale mindset of emotion and behaviour had only modest internal reliability. Consequently, a higher measurement error may have occurred, resulting in biased estimates of intervention effects and a loss of power to detect them. Finally, as this study was conducted along a certain time path, and recruitment of participants with intellectual disabilities is known to be challenging and time consuming, no time was left to recruit more participants with intellectual disabilities acting like an active control condition and/or invent active

control material. Although previous research showed that a mindset intervention was more effective than both a passive (no intervention) as well as an active control condition (Aronson et al., 2002; Yeager et al., 2013), we cannot exclude the possibility that perhaps effect sizes of TGF would have come out differently had we, in this particular study, used an attention-matched control group. Notwithstanding these limitations our study was the first randomised trial evaluating the impact of an online mindset intervention developed for youth with intellectual disabilities, with four measurements. Other strengths were that we measured the degree of beneficial effects of TGF in a 'real-world' setting, working with an adequate and diverse sample size of youth.

Clinical implications and Future research

Our outcomes highlight potential clinical implications. First, in order to motivate youth with intellectual disabilities it may be useful for clinicians (e.g., psychologist, (group) mentor, therapist), to directly elicit and address clients' mindset about the degree to which their problematic and distressing emotions are malleable through their efforts, by seeking help from others, and by trying new strategies (Burnette et al., 2020). Second, the incorporation of mentors, parents and others in mindset interventions and creating supportive peer climates may be an effective way to foster growth mindsets and promote sustained effects (Fraser, 2018; Yeager et al., 2019; Yeager & Walton, 2011). Potential areas for future research are the necessity for youth with intellectual disabilities to receive the sessions at a higher level of intensity and implement additional and extended booster sessions to boost and uphold the initial intervention effects and engender long-term changes (Campbell et al., 2014). Third, it is important to create a more in depth understanding for whom mindset interventions work (moderators) and why by investigating the working mechanism (mediators) of TGF (Verberg et al., 2022). Fourth, future research should replicate our initial exploratory factor analysis using larger youth samples with intellectual disabilities to confirm the psychometric properties of the mindset and perseverance questionnaire. Finally, future studies should use an active, attention-matched control condition to draw more conclusive evidence and ensure the effects can be uniquely ascribed to the intervention.

Conclusion

This study features the first RCT investigating a novel, online mindset intervention developed specifically for youth with intellectual disabilities. The findings demonstrate that a mindset intervention can be used in this vulnerable group to accelerate improvements in mindsets and mental health.

Table 3

Means and Standard Deviations for Intervention and Control Group at Pre- and Post-Test and 3 and 6 months Follow-Up

Variable	Intervention group ^a								Control group ^b							
	T0		T1		T2		T3		T0		T1		T2		T3	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Mindset																
Mindset EB	3.75	0.61	3.83	0.45	3.92	0.55	3.92	0.49	3.59	0.61	3.78	0.63	3.78	0.52	3.75	0.52
Mindset IQ	3.11	0.76	3.30	0.80	3.34	0.80	3.41	0.83	3.02	0.96	3.05	0.86	3.02	0.93	3.06	0.88
Perseverance	3.76	0.57	4.06	0.41	4.08	0.52	4.03	0.48	3.86	0.54	3.84	0.55	3.90	0.65	3.93	0.58
Empowerment																
Total	3.62	0.54	3.66	0.47	3.68	0.54	3.76	0.40	3.55	0.48	3.59	0.53	3.67	0.48	3.69	0.53
Intrapersonal	3.54	0.63	3.59	0.55	3.64	0.65	3.71	0.47	3.44	0.52	3.49	0.59	3.60	0.52	3.64	0.56
Interactional	3.74	0.52	3.76	0.47	3.75	0.55	3.84	0.49	3.72	0.58	3.73	0.59	3.78	0.61	3.76	0.63
Mental health problems																
Total	1.66	0.36	1.52	0.35	1.48	0.33	1.44	0.30	1.59	0.32	1.58	0.37	1.56	0.35	1.46	0.34
Internalizing	1.66	0.47	1.47	0.40	1.41	0.42	1.41	0.32	1.58	0.46	1.57	0.50	1.55	0.44	1.40	0.40
Externalizing	1.50	0.43	1.42	0.38	1.41	0.37	1.32	0.34	1.44	0.35	1.41	0.40	1.43	0.42	1.34	0.37
Attention	1.86	0.49	1.68	0.46	1.63	0.45	1.62	0.42	1.77	0.50	1.79	0.50	1.73	0.50	1.68	0.50
Self-esteem	3.02	0.50	3.07	0.40			3.15	0.37	3.00	0.49	3.01	0.50			3.12	0.43
Motivation																
Total	2.98	0.92	2.71	0.85			2.46	0.76	2.79	0.79	2.71	0.81			2.57	0.79
Problem recognition	2.71	0.96	2.50	0.94			2.27	0.89	2.48	0.81	2.52	0.79			2.33	0.82
Treatment readiness	3.35	1.10	2.99	0.93			2.71	0.96	3.20	1.01	2.96	1.15			2.90	1.05
Therapeutic Alliance																
Total	2.82	0.52	2.82	0.39			3.00	0.43	2.75	0.52	2.67	0.57			2.87	0.50
Collaboration	2.84	0.54	2.89	0.45			3.08	0.44	2.77	0.52	2.68	0.57			2.92	0.54
Bond	2.80	0.58	2.76	0.45			2.94	0.48	2.73	0.63	2.66	0.66			2.84	0.55
Challenge seeking																
							2.26	0.63							2.17	0.71

Note. ^a T0 n = 60; T1 n = 55; T2 n = 55; T3 n = 54.

^b T0 n = 59; T1 n = 58; T2 n = 55; T3 n = 52.

Table 4*Effects of The Growth Factory at Post-Test, and Follow-Up at 3 and 6 months*

<i>Variable</i>	<i>T0 – T1</i>			<i>T0 – T2</i>			<i>T0 – T3</i>		
	<i>B</i>	<i>SE B</i>	<i>p</i>	<i>B</i>	<i>SE B</i>	<i>p</i>	<i>B</i>	<i>SE B</i>	<i>p</i>
<i>Mindset</i>									
Mindset EB	-0.027	0.079	.730	0.107	0.169	.526	0.149	0.045	.001
Mindset Intelligence	0.104	0.065	.108	0.148	0.058	.010	0.148	0.054	.006
Perseverance	0.225	0.077	.000	0.152	0.066	.020	0.085	0.044	.052
<i>Empowerment</i>									
Total	0.035	0.072	.622	-0.040	0.090	.654	0.060	0.056	.290
Intrapersonal	0.036	0.069	.607	-0.005	0.114	.968	0.050	0.077	.512
Interactional	0.023	0.061	.702	-0.041	0.057	.479	0.051	0.082	.397
<i>Mental health problems</i>									
Total	-0.164	0.032	.000	-0.181	0.034	.000	-0.090	0.063	.152
Internalising	-0.161	0.045	.000	-0.215	0.053	.000	-0.064	0.081	.426
Externalising	-0.043	0.038	.263	-0.060	0.058	.306	-0.053	0.050	.286
Attention	-0.167	0.047	.000	-0.138	0.050	.006	-0.083	0.050	.092
<i>Self-esteem</i>	0.054	0.015	.000				0.025	0.077	.690
<i>Treatment motivation</i>									
Total	-0.083	0.058	.034				-0.141	0.074	.055
Problem recognition	-0.088	0.036	.015				-0.106	0.084	.207
Treatment readiness	-0.041	0.051	.420				-0.135	0.079	.090
<i>Therapeutic Alliance</i>									
Total	0.089	0.068	.192				0.053	0.106	.616
Collaboration	0.154	0.056	.006				0.106	0.109	.336
Affective Bond	0.036	0.063	.567				0.015	0.079	.852
<i>Challenge seeking</i>							0.069	0.058	.230

Note. T0 = pre-test; T1 = post-test; T2 = follow-up at 3 months; T3 = follow-up at 6 months; *B* = standardized regression coefficient; *p* values are corrected with Benjamini-Hochberg False Discovery Rate correction.

Appendix

Outline of the Online Mindset Intervention The Growth Factory

Session	Content
1. Learning something new	<p>Plasticity of the brain. The brain is like a muscle that gets stronger and works better the more it is exercised. Every time you practise, your brain forms new connections and connections get stronger.</p> <p>Assignment 1: Practice with the brain (e.g., 'The brain consists of a lot of connections. Click on a connection in the head', and 'What would you like to improve? Or would you like to learn something new? Click on the brain and form new connections').</p> <p>Assignment 2: Answer 'How is it possible we can learn something new or become better?'</p>
2. Mindset	<p>The concept of mindset and the difference between a fixed and growth mindset in terms of the role of effort, and reactions to setbacks and criticism from others.</p> <p>Assignment 1: Choose between sentences related to either a growth or fixed mindset .</p> <p>Assignment 2: What mindset do you have? Choose between 'growth', 'fixed', and 'a bit of both'.</p> <p>Assignment 3: Write down 2 or 3 things you have learnt since you grew up.</p>
3. Growth Mindset: Effort, setbacks, and criticism	<p>Benefits of a growth mindset: a different perspective on effort, setbacks, and criticism from others. The term 'growth thoughts' is introduced. Peer role models: video clips Mycha and Tim.</p> <p>Assignment 1: Practise with growth thoughts about effort, setbacks, and criticism from others.</p> <p>Assignment 2: Choose between two sentences and pick the growth thought of Mycha and Tim.</p> <p>Additional exercise based on the principles of cognitive behavioural therapy: Practice with a situation to learn the different impact of a 'growth and fixed thought' on feelings and behaviour.</p>

<p>4. Recipe for Growth, part 1+2: Effort and good strategies</p>	<p>Becoming aware of the need of effort and finding an adequate strategy to develop and accomplish goals. Peer role models: video clips Floor and Patrick.</p> <p>Assignment 1: Click on all words related to effort and answer the question 'Describe a situation where you tried different strategies to reach your goal'.</p> <p>Assignment 2 (Floor): Can you think of a strategy for yourself that makes you calm?</p> <p>Assignment 3 (Patrick): Write down what setback you have ever had. 'Which growth thoughts could help you deal with your adversity?' and 'Which strategy could help you deal with this setback?'</p> <p>Additional exercises based on the principles of cognitive behavioural therapy: Practise with a situation of your own by changing a fixed thought into a growth thought to see the impact on feelings and behaviour. Select three of six statements that are true about thoughts and growth thoughts.</p> <p>Becoming aware that sometimes it is necessary and can be rewarding to ask for help, and learn to ask for help in an appropriate way using the 5-step plan. Peer role models: video clips Janka and a compilation video where youth discuss the benefits of asking for and accepting help.</p>
<p>5. Recipe for Growth, part 3: Help from others</p>	<p>Assignment 1: Choose the growth mindset sentences related to asking for help and pick these sentences helpful for yourself.</p> <p>Assignment 2 (Janka): Choose between 'making a difficult assignment for school' or 'not getting angry so quickly' and practise with the 5-step plan to ask for help.</p> <p>Assignment 3: Answer the questions 'Where did you ever get help with?', 'Whom did you ask for help?', 'Did you get help immediately?', and 'Did you like to get help?'</p> <p>Assignment 4: Explain to others why it is good if you can ask for and accept help from others.</p> <p>Additional exercise: Practise with the 5-step plan to ask for help in a role play.</p>
<p>6. Freshen Up</p>	<p>Repetition of the most important information through a compilation of the previous sessions.</p> <p>Assignment 1: Click on all terms belonging to a growth mindset. Drag them to the stairs and climb to your goal.</p> <p>Assignment 2: Answer 'What would you like to learn?' and reach this goal by using each step of the growth recipe.</p> <p>Assignment 3: Write down as many things as possible that you have learned and want to remember from TGF.</p>
<p>7. Booster session</p>	<p>Repetition of session 6.</p>

Chapter 6

Online mindset intervention The Growth Factory: Moderators and mediators of intervention effect

6

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Abstract

Background

The online mindset intervention The Growth Factory (TGF) has shown promising effects—increasing growth mindsets and perseverance, and decreasing mental health problems among youth with intellectual disabilities (ID). Studying moderators and mediators of intervention effects is essential to elucidate for whom and why TGF works. Using a RCT design, we examined youth’s baseline mindset, gender, age, level of ID, and intervention satisfaction as moderators of TGF effects and examined whether the intervention effects of TGF on improvements in mental health were mediated by perseverance.

Methods

The sample consisted of 119 participants with mild to borderline ID ($M_{age} = 15.83$; $SD = 2.23$), randomly assigned to the intervention ($n = 60$) or passive control group ($n = 59$). Participants reported mindsets, perseverance, internalising, externalising, attention, and total mental health problems at pre-test, post-test, and at 3 months follow-up. Additionally, youth in the intervention group graded their satisfaction with a score at the end of each session.

Results

Findings indicated that the effectiveness of TGF was not affected by participants’ baseline mindsets, age, and ID level. TGF was more effective in reducing internalising problems in girls, and increasing perseverance in boys. In addition, in the intervention group TGF was more effective in improving internalising, externalising, and total mental health problems for youth who reported higher levels of intervention satisfaction at post-test. Finally, TGF indirectly decreased internalising and externalising problems at follow-up, through improvements in perseverance reported at post-test.

Conclusions

TGF offers a universal, “add-on” mindset intervention complementing usual care programs. It improves mindsets, perseverance and mental health in youth with ID. Both practical and theoretical implications are discussed.

Introduction

Youth with intellectual disabilities (ID) form an at-risk population for a variety of outcomes. Specifically, compared to their peers without ID, youth with ID are more likely to experience emotional and behavioural problems (referred to as mental health problems), such as depression and aggression, and low self-esteem (e.g., De Ruiter et al., 2007; Einfeld et al., 2011). In addition, previous research demonstrated that youth with ID are more likely to endorse a fixed mindset—the belief that personal characteristics such as emotions, personality, and intelligence are static and uncontrollable—compared to typically developing peers (Baird et al., 2009; Koestner et al., 1995; Verberg et al., 2019). While a growth mindset—the belief that characteristics are malleable—has repeatedly been related to a variety of beneficial outcomes on mental health, prosocial behaviour, and academic performance in youth with and without ID (e.g., Baird et al., 2009; Koestner et al., 1995; Verberg et al., 2019; Yeager et al., 2013, 2016; for a meta-analysis, see Schleider et al., 2015).

Extensive evidence suggests that growth mindsets can be cultivated by mindset interventions (e.g., Schleider & Weisz, 2016b, 2018; Yeager et al., 2016). These brief psychological interventions, generally one to eight sessions and executed face-to-face or using a computer program, convey messages about the malleability of personal attributes. The aim is to enhance growth mindsets and thereby positively impacting academic, social and psychological outcomes (Yeager & Dweck, 2012; Yeager & Walton, 2011). Despite some recent unsupportive evidence and discussion about meaningful effect sizes (Calvete et al., 2019; Foliano et al., 2019; Sisk et al., 2018), promising effects of mindset interventions have generally been found (Miu & Yeager, 2015; Schleider & Weisz, 2016b; Yeager et al., 2014). Due to the increased risk of mental health problems, as well as more fixed-oriented mindsets in youth with ID, a mindset intervention cultivating a growth mindset may be a successful way to reduce mental health problems in this at-risk population.

Therefore, we developed the online mindset intervention The Growth Factory (TGF) for youth with ID. The six sessions of TGF are structured around the key growth mindset affirmations (e.g., Dweck, 1999; Yeager & Dweck, 2012; Yeager et al., 2016) by emphasising: (1) the potential for brain plasticity, (2) the assumption that one's characteristics (i.e., emotions, behaviours and skills) are malleable and have the potential to change, (3) that people are personally in charge of this process by teaching the formula for successful change: effort, changing strategies, help from others, and 4) that change is neither easy nor certain and may only happen over time—but is usually possible. Besides the use of animations, interactive assignments, movie clips of successful role models, and "saying-is-believing" exercises, TGF contains exercises based on the principles of cognitive behavioural therapy, role play, biweekly reminders, and homework assignments (Aronson et al., 2002; Yeager & Walton, 2011; Yeager et al., 2016).

In a previous study we investigated the effectiveness of TGF in youths with ID ($N = 119$; 12–23 years) using a randomised controlled trial (Verberg et al., 2021). Findings showed

that TGF had positive effects among others on perseverance, internalising, attention, and total mental health problems immediately after the intervention, and on mindsets at 3 (intelligence) and 6 (intelligence, and emotion and behaviour) months follow-up (Verberg et al., 2021). Besides obtaining insight into the effectiveness of TGF, it is important to create a more in-depth understanding for *whom* TGF works and *how* TGF works. Therefore, the aim of the present study is to further elaborate on our previous results and examine whether (1) the effectiveness of TGF on mindsets, perseverance, and mental health problems is moderated by youth's baseline mindsets, gender, age, ID level, and intervention satisfaction, and (2) the effect of TGF on mental health problems at 3 months follow-up (partially) runs via improvements in perseverance at post-test. Logically, the current study used the same sample as the sample that was used in Verberg et al. (2021).

Moderators of mindset intervention effects

Until now most studies have mainly focused on the main effects of mindset interventions, but uncovering for whom mindset interventions are more beneficial has received little attention. When (certain) moderators were included within mindset studies among the general population, results demonstrated that individuals with low social dominance orientation (i.e., endorsing equality among social groups), poorly performing students, and black students with high expectations for future educational attainment benefitted the most from mindset interventions (Binning et al., 2018; Hoyt et al., 2018; Paunesku et al., 2015). Other studies found no moderating effects or mixed results of baseline mindset, age, gender, and socioeconomic status (e.g., Aronson et al., 2002; Blackwell et al., 2007; Miu & Yeager, 2015; Paunesku et al., 2015; Sisk et al., 2018; Yeager et al., 2011, 2014). To the best of our knowledge, previous studies have not examined moderators of the effectiveness of mindset interventions for youth with ID. In this study we examined youth's baseline mindset (i.e., mindset of intelligence, and mindset of emotion and behaviour), age, gender, level of ID, and intervention satisfaction as moderators of the effectiveness of TGF.

First, it has been found that people who initially endorse a more fixed mindset, compared with those holding a more growth-oriented mindset, generally benefit more from mindset interventions as it is hypothesised they have more to gain from learning the growth mindset affirmations (Blackwell et al., 2007; Broda et al., 2018; Miu & Yeager, 2015; Yeager et al., 2014, 2016). In contrast, other studies demonstrated that mindset interventions help to reduce aggression, stress, and health regardless of baseline mindset (Broda et al., 2018; Yeager et al., 2013). Therefore, in the present study we will explore whether the effectiveness of TGF is moderated by baseline mindset.

Second, it has been suggested that intervention effects may be weaker for people with ID as thinking, processing information, and learning occur at a slower rate (Campbell et al., 2014; De Wit et al., 2011). However, a meta-analysis examining the moderating role of level of ID (i.e., mild (IQ 50–69), moderate (IQ 35–49), severe (IQ 20–34), and profound (IQ < 20) on intervention effects on challenging behaviour, did not show an association with treatment effects (Heyvaert et al., 2010). It is important to note, however,

that participants with borderline intellectual functioning (IQ 70–85) were not included in this meta-analysis (Heyvaert et al., 2010). Unlike other countries, in the Netherlands individuals with borderline intelligence and with severe limitations in adaptive functioning are eligible for access to healthcare and special education systems for individuals with ID. Therefore, our study included youth with mild ID *and* borderline intellectual functioning (IQ 50–85).

Third, although intervention satisfaction has not yet been examined as a moderator in studies concerning mindset intervention effects, positive associations between treatment satisfaction and treatment outcomes, such as fewer psychiatric symptoms and substance use problems, are commonly found (Boden & Moos, 2009; Zhang et al., 2008). Therefore, we will investigate whether TGF intervention effects might be influenced by the satisfaction of participants with the intervention.

Finally, the literature currently is unclear whether gender and age actually moderate mindset intervention effects in the general population (e.g., Paunesku et al., 2015; Yeager et al., 2011, 2013). Despite mixed findings, it is relevant to include these variables in this first exploratively study into moderators of mindset intervention effects because of the heterogenous population of people with ID.

Mediators of mindset intervention effects

Although mindset interventions have shown to be effective in reducing mental health problems in youth with and without ID (Schleider et al., 2015; Verberg et al., 2021; Yeager et al., 2013, 2014), little is known about the mediating mechanisms that may more fully explain how these intervention effects come about. A previous study in the general population demonstrated that a mindset intervention decreased students' vulnerability to dysphoria through the reduction of self-critical rumination (Baer et al., 2005). Another study among participants without ID showed that a mindset intervention strengthened youths' capacity to recover from stress through increases in a growth-oriented mindset and perceived control (Schleider & Weisz, 2016b). One possible mediator that has not yet been examined is perseverance. We decided to focus on the mediator perseverance because of the significant intervention effects of TGF on perseverance at post-test.

Perseverance refers to an array of self-regulatory processes in terms of attributions and reactions to effort, failure, and challenges. As previously stated in the literature, mindset and perseverance are closely related concepts (Burnette et al., 2013; Mrazek et al., 2018; Sisk et al., 2018). In particular, when people believe in the malleability of their traits, they will be more eager to learn and practice, embrace challenges as learning opportunities, and exert effort in the face of setbacks as they attribute failure as a result of insufficient effort or strategy. People with a fixed mindset, on the other hand, will interpret failure as a lack of ability and will generally feel helpless to change their circumstances (e.g., Blackwell et al., 2007; Burnette et al., 2013; Duckworth et al., 2007; Mrazek et al., 2018). Mindset interventions have positively affected perseverance in the general population (Blackwell et al., 2007; Burgoyne et al., 2018; Dweck & Leggett, 1988; Mrazek et al., 2018; Yeager et al., 2016). Recently, our prior work extend these findings by showing

that TGF was also effective in improving perseverance among youth with ID (Verberg et al., 2021). The effect on perseverance might be explained by TGF's explicit focus on the potential benefits of effort in learning and changing emotions and behaviours, finding an effective strategy, and persisting despite setbacks. Therefore, perseverance might play a key role as mechanism in TGF's effects on mental health problems. In the present study we will therefore examine whether the reductions in mental health problems are obtained through improvements in perseverance.

Present study

The first objective of the present study was to examine the moderating role of baseline mindsets, gender, age, level of ID, and intervention satisfaction on immediate effects of the online mindset intervention TGF on mindsets (i.e., mindset of intelligence, mindset of emotion and behaviour), perseverance, and mental health (i.e., internalising, externalising, attention, and total mental health problems). We hypothesised that adolescents with a more fixed mindset at baseline, with borderline intellectual functioning, and with higher intervention satisfaction scores would show larger increases in growth mindsets and perseverance and larger decreases in mental health problems compared to adolescents with a more growth mindset at baseline, with mild ID, and with less satisfaction with the intervention. In addition, we explored whether gender and age moderated the intervention effects. The second objective of the current study was to examine perseverance as a mediator of TGF effects on mental health outcomes in ID youth. For this analysis, we also used the follow-up assessment.

Method

Design

We conducted a randomised controlled trial (RCT). Findings on the direct effects of TGF are published elsewhere (Verberg et al., 2021). Prior to data collection for the initial RCT (Verberg et al., 2021), a power analysis (two-tailed, alpha 0.05, statistic power 0.80) based on a three measurements design, indicated that 106 participants were necessary to obtain significant results for the RCT. In addition, prior to main analyses, we checked possible baseline differences in demographic variables and study outcomes between the intervention and control group, using independent-sample t-tests and chi-square tests. Ethical approval was granted by The Ethics Review Board of the University of Amsterdam (2015-CDE-4518) and the study was registered in the Dutch Trial Register for RCT's (www.trialregister.nl; NTR5460). A comprehensive description and tables and figures of the trial design, participants, procedure, and measures can be found in previous publications (Verberg et al., 2018, 2019, 2021). The analyses presented in *this* paper focus on the effects at post-test (moderation) and 3 months follow-up (mediation).

Participants

Participants were recruited from a residential care organisation and six special education schools for youth with ID and comorbid physical and/or psychiatric problems in the Netherlands. Data collection took place in five rounds between October 2015 and 2017 (pre-covid). In total 124 youths were included in the present study, but five participants dropped out before the pre-test. One participant showed resistance before start and four participants were unable to fill in the questionnaires due to their intellectual disability. The final sample consisted of 119 participants with a mean age of 15.83 years ($SD = 2.23$) and an average intelligence score of 66.41 (range 50–85). In addition to an intellectual disability, the majority of the participants (92.4%) were diagnosed with comorbid problems including a physical disability (e.g., cerebral palsy, spina bifida), psychiatric disorder (e.g., attention deficit hyperactivity disorder) or both (see Table 1). Attrition was low with 9 (7.6%) participants dropping out of the study until 3 months follow-up. Participant flow is shown in Figure 1.

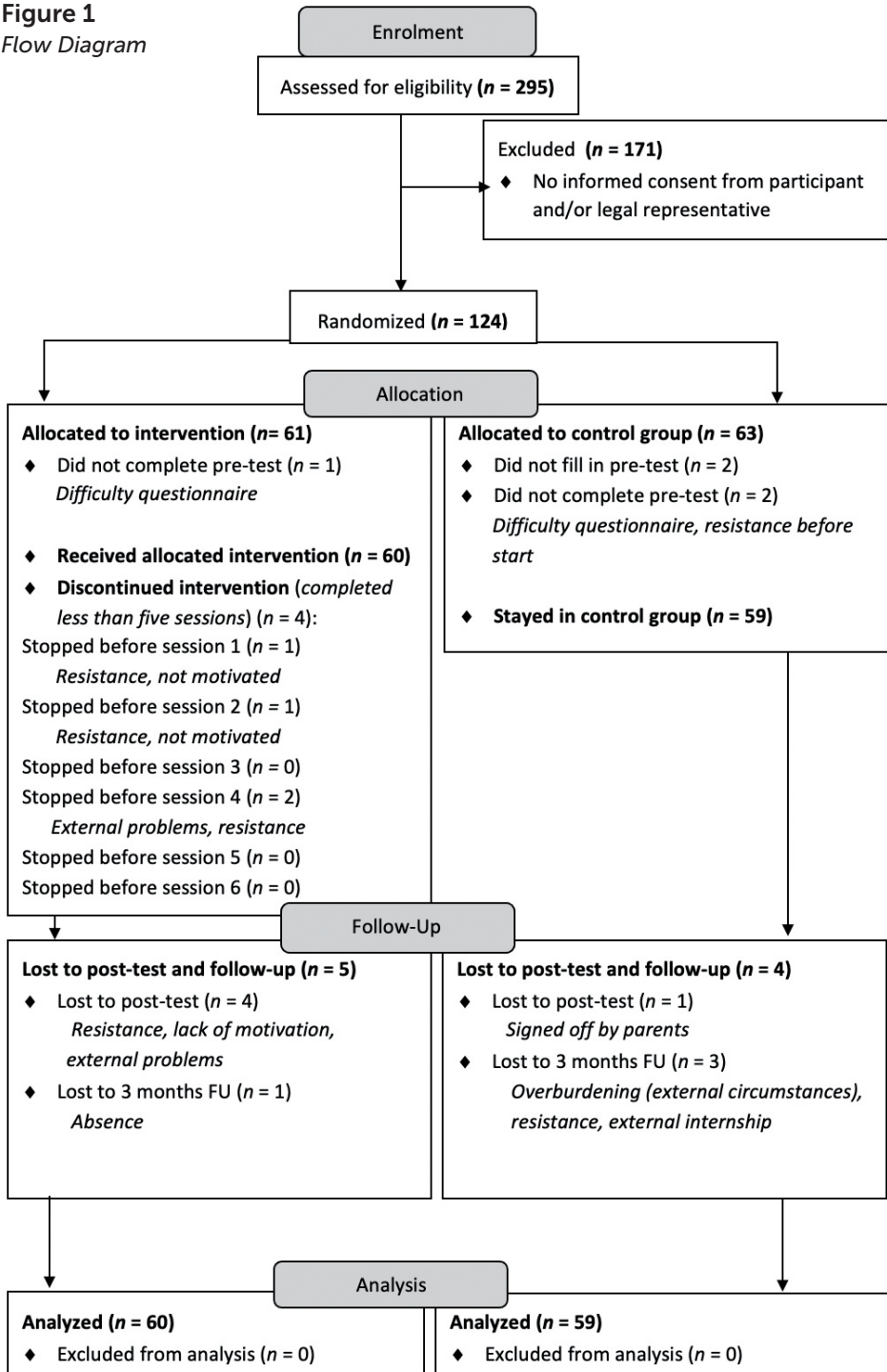
Table 1

Participants' Characteristics and Group Differences at Pre-Test

Variable	Intervention (<i>n</i> = 60)		Control (<i>n</i> = 59)		Total (<i>N</i> = 119)		Statistics
<i>Gender</i>	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>t</i>
Male	35	58.3	34	57.6	69	58	$t(117) = -.08, p = .94$
Female	25	41.7	25	42.4	50	42	
<i>TIQ – M (SD)</i>	66.9 (10.03)		65.9 (9.08)		66.4 (9.54)		$t(117) = -.56, p = .58$
<i>Age – M (SD)</i>	15.9 (2.25)		15.8 (2.22)		15.8 (2.23)		$t(117) = -.38, p = .70$
<i>Age groups</i>							$t(117) = -.34, p = .74$
Early ad (<15 yrs)	22	36.7	24	40.7	46	38.7	
Mid-late ad (>15 yrs)	38	63.3	35	59.3	73	61.3	
<i>Level of ID</i>							$t(117) = -.34, p = .74$
Mild ID	41	68.3	42	71.2	83	69.7	
Borderline IF	19	31.7	17	28.8	36	30.3	
<i>Comorbidity</i>	53		57		110		92.4
Physical disability	36	67.9	41	71.9	77	70.0	$t(117) = .43, p = .67$
Psychiatric problem	5	9.4	8	14.0	13	11.8	$t(117) = -.15, p = .88$
Multiple	12	22.6	8	14.0	20	18.2	$t(117) = -.94, p = .35$

Note. ad = adolescence; yrs = years; ID = intellectual disability; IF = intellectual functioning. Multiple = physical disability and psychiatric problem

Figure 1
Flow Diagram



score within the mild (IQ 50–69) or borderline (IQ 70–85) ID range. Exclusion criteria were severe emotional problems, such as extreme aggression problems or an acute unstable mental condition, hindering participation in the study. Informed consent was obtained from all participants and their legal representatives. After randomisation, participants were informed about the allocation to the intervention or control group by their mentor. Self-report questionnaires and additional information from case files (i.e., age, gender, diagnoses and IQ) were used. Questionnaire assessments were conducted at pre-test, post-test, and a follow-up at 3 months after the intervention. Questionnaires were completed on a computer and all youth were guided individually by a trained research assistant. Research assistants read all questions aloud, checked participants understanding, used standardised clarification and provided help if needed. For six consecutive weeks, youths in the intervention group participated individually in six sessions lasting 25–40 minutes as an addition to their usual care program. Participants assigned to the control group attended the school curriculum or care as usual.

Measures

Based on the Dutch guideline for developing, adjusting and conducting diagnostic instruments for people with ID (Douma et al., 2012), the following questionnaire adjustments were made to reduce the complexity of the item content and task load for participants: (1) difficult words and sentences were simplified or rephrased, (2) answering categories were unified into one format ranging from ‘completely untrue’ to ‘completely true’, and (3) answering categories were supported with colored emoticons.

Mindset and Perseverance

Beliefs about the malleability of emotion and behaviour and intelligence, and participants’ perseverance (i.e., attributions and responses to effort, failure, and challenges) were assessed using the Mindset and Perseverance Questionnaire (MPQ; Verberg et al., 2019). The MPQ consists of two parts measuring mindset of emotion and behaviour, and mindset of intelligence (9 items, e.g., ‘I can learn to control how I feel’ and ‘How smart I am is sort of fixed’), and adolescents’ perseverance (9 items, e.g. ‘Practising a lot is useless’). Items were scored on a 5-point Likert scale and all fixed mindset statements were reverse-scored such that higher scores indicated a growth mindset and more perseverance. Reliability coefficients of the MPQ among youth with ID and youth with special needs have previously been reported to range from modest to adequate (Helmond et al., 2022; Verberg et al., 2019, 2021). In the present study Cronbach’s alphas for pre-test, post-test, and follow-up at 3 months respectively showed $\alpha = .61, .56,$ and $.60$ for mindset of emotion and behaviour, $\alpha = .68, .71,$ and $.72$ for mindset of intelligence, and $\alpha = .74, .73,$ and $.82$ for perseverance.

Mental health problems

Mental health problems were assessed using the Dutch version of the Brief Problem Monitor-Youth (BPM-Y; Achenbach et al., 2011; Verhulst & Van der Ende, 2013). The BPM-Y contains nineteen items measuring internalising problems, externalising, and attention problems (e.g., ‘I feel unhappy, sad or depressed’, and ‘I threat other people’). The sum of the items yields a total problem score. Previous research showed sufficient

to good reliability of this instrument among youth with ID and youth with special needs (Helmond et al., 2022, Verberg et al., 2019, 2021). In the present study Cronbach's alphas for the three measurement points showed $\alpha = .76$, $.78$, and $.74$ for internalising problems, $\alpha = .77$, $.77$, and $.78$ for attention problems, $\alpha = .73$, $.73$, and $.74$ for externalising problems, and $\alpha = .85$, $.87$, and $.85$ for the total problems scale.

Intervention satisfaction

At the end of each session, participants in the intervention group were asked to grade their satisfaction with a score from 1 (very low) to 10 (very high). The mean of the satisfaction grade scores of the six sessions was taken to construct an overall mean intervention satisfaction grade.

The Growth Factory intervention

TGF builds on scientific research on mindset theories and mindset interventions by Carol Dweck and David Yeager (Dweck, 1999; Yeager et al., 2013, 2016). The received mindset intervention materials from Yeager and colleagues (Paunesku et al., 2015; Yeager et al., 2013, 2016) were adapted with youth with ID and professionals using the guideline for effective interventions for people with intellectual disabilities (De Wit et al., 2011). A professional graphic designer animated the delivery of content of the intervention. By the online approach we were able to use visual and auditory support, and provide a structured learning environment with the possibilities to repeat parts of a session or make use of extra advice when desired. For a detailed description of the development, structure, and content of the intervention, see our previous studies (Verberg et al., 2018, 2019, 2021).

Statistical analyses

To investigate the moderating effects of baseline mindset (i.e., mindset of emotion and behaviour, and mindset of intelligence), gender, age, level of ID, and intervention satisfaction (grade) on all outcome variables at post-test, we conducted separate multivariate linear regression analyses controlling for gender, total IQ, and age, with a two-step approach. In each separate analysis, in the first step condition and the moderation variable of interest were included in the regression model together with covariates. In a second step the centered cross-product of condition and the moderators of interest were added to the model to test moderation (e.g., condition*baseline mindset of intelligence). When significant, the interaction was plotted further to gain insight into the precise direction of the moderating effect. With respect to potential moderation effects of satisfaction, moderation only focused on those youth who participated in TGF (e.g., internalising problems*satisfaction). We created a low and high satisfaction group by using a median split. To test whether improvements in mental health outcomes at 3 months follow-up were mediated by changes in perseverance at post-test, we conducted multivariate linear regression analyses using Mplus Version 7 (Muthén & Muthén 1998-2012), while controlling for gender, age, total IQ, and baseline perseverance. Mediation was tested using indirect effects (by using the MODEL INDIRECT command) and bootstrapping with 5000 random draws (MacKinnon et al., 2007).

The “CLUSTER” command was used to take in account the non-independence of data due to youths receiving school or care at different treatment locations which could otherwise artificially inflate the standard errors of the parameter estimates. As a consequence, we used the MLR-estimator. MLR (Maximum likelihood with robust standard errors) is a maximum likelihood method that takes clustering of cases into account and estimates parameters with standard errors and a chi-square test statistic (when applicable) that are robust to non-normality and non-independence of observations when used with “TYPE=COMPLEX”. This maximum likelihood method, by which parameters are estimated using available data with robust standard errors, is also used in strategies to handle missing data. Specifically, after the parameters are estimated using the available data, missing data are estimated based on the parameters which have just been estimated (Muthén & Muthén, 1998-2012). The Benjamini-Hochberg false discovery rate correction was used to correct for chance capitalisation across all tests (Benjamini & Hochberg, 2005). The p -values after this correction are presented in the Results section. All analyses were based on an intention-to-treat sample (i.e., including data from all participants, whether or not they completed all sessions and assessments). In addition, a completers-only analysis was conducted (i.e., involving only adolescents in the intervention group who completed five or six sessions; $n = 56$). The analyses were reported in accordance with the CONSORT Statement (Schulz et al., 2011). See the CONSORT-SPI 2018 checklist included in the Supplementary Materials.

Results

Preliminary results

At baseline, participants in the intervention and control group did not significantly differ on demographic (see Table 1) and outcome variables (all $p > .10$; Verberg et al., 2021). In addition, no outliers were found and analyses with completers-only revealed similar results. Table 2 shows descriptive statistics for the outcome variables mindsets, perseverance, and mental health problems at pre-test and post-test. For convenience of the reader, Table 3 shows the direct effects of TGF on mindsets, perseverance and mental health problems at post-test (Verberg et al., 2021).

Moderators of intervention effects

The main analyses of this study pertained to the analysis of the potential moderators and mediators on the effectiveness of TGF. Table 4 shows all findings for the interaction terms on mindsets, perseverance, and mental health problems. Because of the large number of interactions that were tested, we here *only* report the findings for the significant interactions.³

³ A complete overview of each separate regression analysis and its findings can be obtained from the first author

Table 2

Means and Standard Deviations for Intervention and Control Group at Pre- and Post-Test

	<i>Intervention group^a</i>				<i>Control group^b</i>			
	<i>T0</i>		<i>T1</i>		<i>T0</i>		<i>T1</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Mindset</i>								
Mindset EB	3.75	.61	3.83	.45	3.59	.61	3.78	.63
Mindset IQ	3.11	.76	3.30	.80	3.02	.96	3.05	.86
<i>Perseverance</i>	3.76	.57	4.06	.41	3.86	.54	3.84	.55
<i>Mental health problems</i>								
Total	1.66	.36	1.52	.35	1.59	.32	1.58	.37
Internalising	1.66	.47	1.47	.40	1.58	.46	1.57	.50
Externalising	1.50	.43	1.42	.38	1.44	.35	1.41	.40
Attention	1.86	.49	1.68	.46	1.77	.50	1.79	.50

Note. ^a T0 *n* = 60; T1 *n* = 55; T2 *n* = 55. ^b T0 *n* = 59; T1 *n* = 58; T2 *n* = 55. EB = emotion and behaviour. IQ = intelligence.

Table 3

Effects of The Growth Factory at Post-Test

Variable	Pre-test – Post-test		
	<i>B</i>	<i>SE B</i>	<i>P</i>
<i>Mindset</i>			
Mindset EB	-0.027	0.079	.730
Mindset IQ	0.104	0.065	.108
<i>Perseverance</i>	0.225	0.077	.000
<i>Mental health problems</i>			
Total	-0.164	0.032	.000
Internalising	-0.161	0.045	.000
Externalising	-0.043	0.038	.263
Attention	-0.167	0.048	.000

Note. *B* = standardised regression coefficient. EB = emotion and behaviour. IQ = intelligence. *p* values are corrected with Benjamini-Hochberg False Discovery Rate correction.

Table 4
Moderating Variables of Intervention Effects on Mindsets, Perseverance and Mental Health Problems

Outcome	Interaction	Pre-test – Post-test		
		B	SE	P
Mindset EB	condition x total IQ	-0.044	0.126	.725
	condition x mindset EB T0	-0.073	0.123	.556
	condition x mindset IQ T0	-0.038	0.080	.637
	condition x age	0.090	0.071	.207
	condition x gender	0.031	0.095	.745
Mindset IQ	condition x total IQ	0.122	0.122	.237
	condition x mindset EB T0	0.109	0.078	.161
	condition x mindset IQ T0	0.017	0.017	.715
	condition x age	0.022	0.049	.655
	condition x gender	-0.042	0.068	.536
Perseverance	condition x total IQ	0.065	0.075	.386
	condition x mindset EB T0	-0.023	0.072	.751
	condition x mindset IQ T0	-0.018	0.070	.795
	condition x age	0.013	0.080	.872
	condition x gender	0.084	0.024	.000
Total mh problems	condition x total IQ	-0.014	0.039	.721
	condition x mindset EB T0	0.006	0.040	.989
	condition x mindset IQ T0	-0.001	0.073	.890
	condition x age	-0.003	0.039	.942
	condition x gender	0.022	0.026	.401
Internalising problems	condition x total IQ	-0.023	0.031	.452
	condition x mindset EB T0	-0.023	0.061	.709
	condition x mindset IQ T0	0.046	0.057	.422
	condition x age	-0.038	0.061	.532
	condition x gender	0.080	0.026	.002
Externalising problems	condition x total IQ	-0.001	0.103	.237
	condition x mindset EB T0	0.025	0.066	.703
	condition x mindset IQ T0	0.090	0.054	.098
	condition x age	-0.004	0.038	.910
	condition x gender	0.008	0.039	.835
Attention problems	condition x total IQ	0.003	0.033	.973
	condition x mindset EB T0	-0.037	0.084	.659
	condition x mindset IQ T0	-0.106	0.106	.317
	condition x age	0.014	0.051	.781
	condition x gender	-0.006	0.049	.904
Satisfaction (intervention group)	Mindset EB x satisfaction	0.273	0.148	.065
	Mindset IQ x satisfaction	0.289	0.171	.090
	Perseverance x satisfaction	0.169	0.186	.364
	Total mh problems x satisfaction	-0.244	0.072	.001
	Internalising problems x satisfaction	-0.333	0.088	.000
	Externalising problems x satisfaction	-0.156	0.047	.001
	Attention problems x satisfaction	0.005	0.025	.825

Note. Please note that each line refers to a separate regression analysis. B = standardised regression coefficient. mh = mental health. p values are corrected with Benjamini-Hochberg False Discovery Rate correction.



As is shown, baseline mindsets, age, and level of ID did not moderate intervention effects on mindsets, perseverance and mental health outcomes in the intervention and control group at post-test. Intervention satisfaction and gender *did* have an effect on the effectiveness of the intervention. Specifically, as shown in Figures 2a, 2b, and 2c, intervention effects with respect to reducing internalising, externalising, and total mental health problems were stronger for adolescents who were more satisfied about the intervention compared to those with lower satisfaction scores. In addition, TGF was more effective in reducing internalising problems in girls, and increasing perseverance in boys (Figures 2d and 2e).

Figure 2a

Intervention Satisfaction as a Moderator of Intervention Effects on Internalising Problems

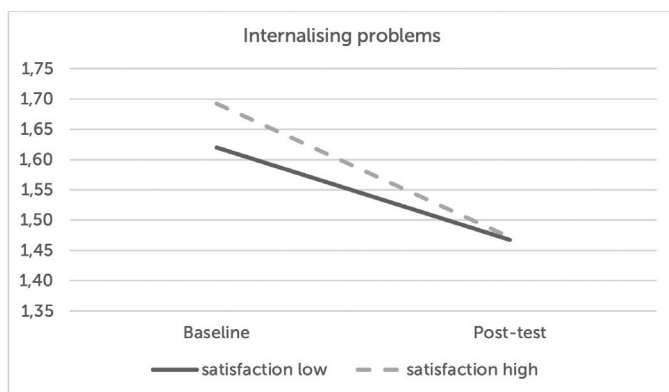


Figure 2b

Intervention Satisfaction as a Moderator of Intervention Effects on Externalising Problems

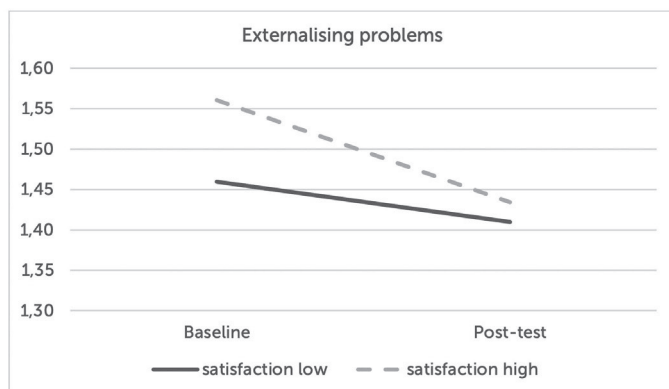


Figure 2c

Intervention Satisfaction as a Moderator of Intervention Effects on Total Mental Health Problems

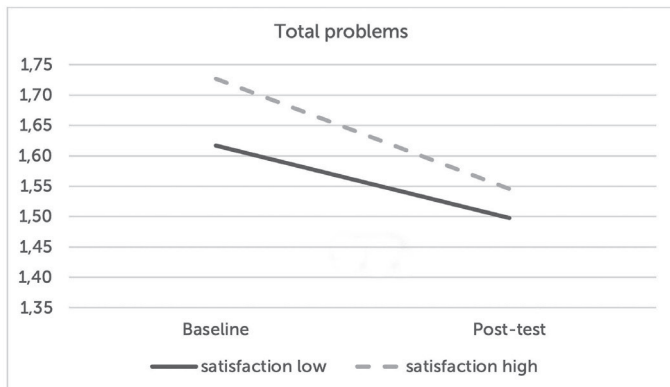


Figure 2d

Gender as a Moderator of Intervention Effects on Internalising Problems

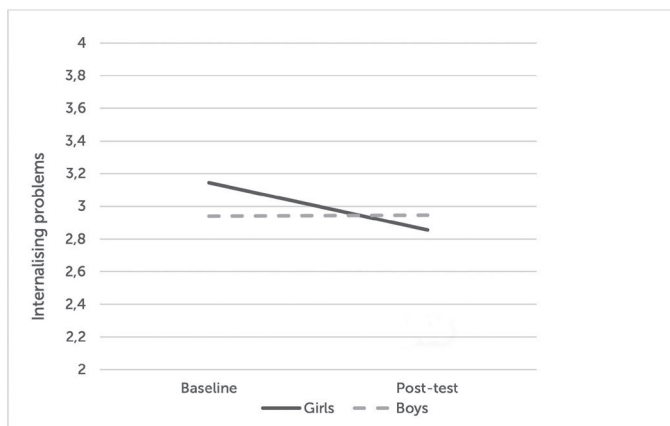
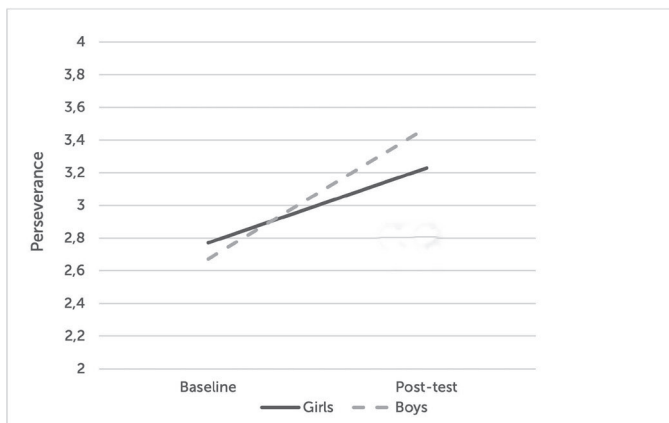


Figure 2e*Gender as a Moderator of Intervention Effects on Perseverance***Mediation effects**

Finally, we examined whether perseverance could account for the intervention effect of TGF on mental health problems. Our previous study (Verberg et al., 2021) showed that TGF had a direct effect on internalising problems. Moreover, the present study demonstrated that the effect of TGF was partially mediated by perseverance ($B_{\text{internalising}} = -0.036$, 95% CI [-0.071, -.001], $SE = 0.018$, $p = .046$). TGF affected internalising problems at 3 months follow-up via perseverance at post-test.

Furthermore, our previous study (Verberg et al., 2021) demonstrated that TGF did not have a direct effect on externalising problems, however, our findings showed support for an indirect effect in which TGF affected externalising problems at 3 months follow-up via perseverance at post-test ($B_{\text{externalising}} = -0.058$, 95% CI [-0.086, -0.031], $SE = 0.014$, $p < .001$). Thus, TGF was associated with improved perseverance, in turn decreasing internalising and externalising problems (see Figures 3 and 4).

Figure 3

Mediation Effect of TGF on Internalising Problems at Follow-Up via Perseverance at Post-Test

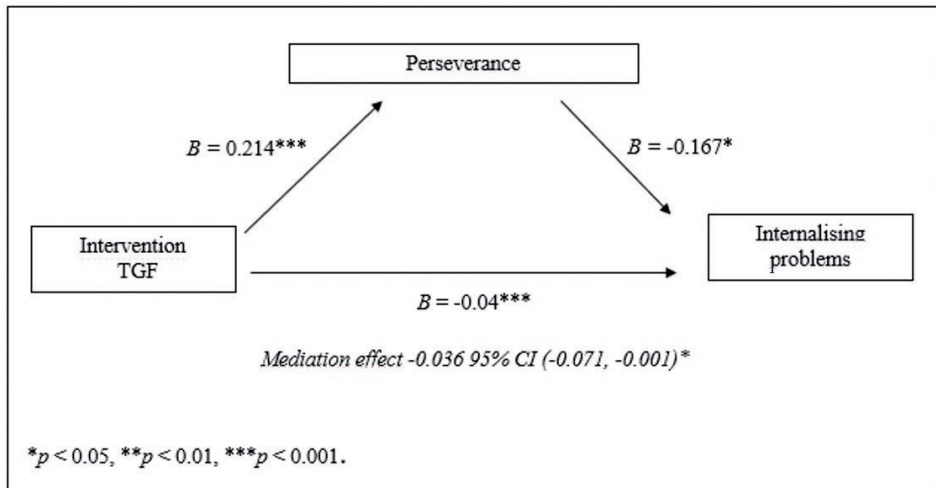
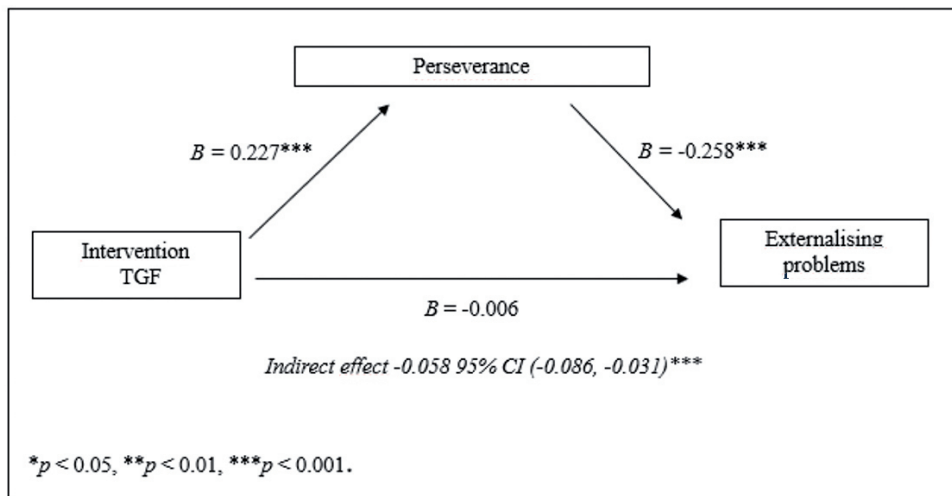


Figure 4

Indirect Effect of TGF on Externalising Problems at Follow-Up via Perseverance at Post-Test



6

Discussion

Previous research showed that The Growth Factory (TGF), an online mindset intervention developed for youth with ID, improves growth mindsets and perseverance and decreases mental health problems in this at-risk population (Verberg et al., 2021). However, it was not yet clear for *whom* and *how* TGF works. Therefore, the objective of the present study was to investigate baseline mindsets, gender, age, level of ID, and intervention satisfaction as moderators of the TGF effectiveness and to examine whether the intervention effects of TGF on improvements in mental health were mediated by perseverance. Results indicated that TGF was similarly effective for adolescents regardless of age, with less or more fixed mindsets at baseline, and for adolescents with different levels of intellectual functioning. However, we did find that participants in the intervention group who were more satisfied with the intervention showed larger reductions of internalising, externalising, and total mental health problems compared to participants who were less satisfied with the intervention. In addition, girls benefitted more from TGF compared to boys in reducing internalising problems. In contrast, TGF was more effective in increasing perseverance in boys. Moreover, we found that TGF indirectly reduced internalising and externalising problems at 3 months follow-up through improvements in perseverance.

Our findings are in line with existing evidence that mindset interventions lead to improved mental health across different subgroups (e.g., Miu & Yeager, 2015; Paunesku et al., 2015; Schleider et al., 2020; Yeager et al., 2011). A possible explanation for this might be that TGF maximises the fit between participants with diverse characteristics and the intervention. Purposefully, in developing TGF, special care was taken to increase the likelihood that participants would identify with one of the avatars or 'buddies' by creating avatars with different characteristics and by creating role models in the video-clips whose stories and struggles matched those oftentimes reported by youth with ID and professionals (Binning et al., 2018; Yeager & Walton, 2011). Additionally, youth were allowed to personalise their responses (e.g., by choosing their own topic in an assignment) so intervention materials evoked the intended experience in the way that was most relevant to them (Yeager & Walton, 2011). Finally, the online approach provided the opportunity to adjust the level of support and repetition increasing the probability to address participants' individual information processing needs (De Wit et al., 2011).

This study confirms the relevance of considering intervention satisfaction as a moderator of intervention effects, as youth in the intervention group who were more satisfied with TGF demonstrated larger effects in reducing internalising, externalising, and total mental health problems. This finding is in line with previous research, suggesting that intervention satisfaction might be a good proxy for engagement in and positive reactions to an intervention contributing to treatment outcomes (Boden & Moos, 2009; Dearing et al., 2005). In addition, finding ways to improve intervention satisfaction might contribute to the effectiveness of interventions. Notably, with respect to gender, TGF was more effective in increasing perseverance in boys and in reducing internalising problems in girls. This could be explained by the contrasting coping strategies boys and

girls have with regard to mental health problems (Kelly et al., 2008; Schleider & Weisz, 2016a). For example, girls tend to engage more in self-critique and rumination, whereas boys are more eager to blame others to reduce negative feelings (Schleider & Weisz, 2016a). Therefore, for boys the TGF key messages that encourage effort and that teach that they are personally in charge of changing their emotions and behaviours may have resulted in increased perseverance, whereas for girls learning about the malleability of personal traits may have resulted in opportunities to change internal states and self-critique.

Interestingly, although there was no direct effect of TGF on externalising problems, TGF did indirectly reduce externalising problems through improvements in perseverance. One potential explanation is that teaching people to tolerate challenges and failures toward goal achievement increases their awareness of how their daily actions and habits are instrumental in achieving goals and changing emotions and behaviour (Zainal & Newman, 2019). Moreover, TGF encourages participants to cope with obstacles and challenges by putting in effort, exploring different strategies and to ask for help. This may have helped TGF participants to disconfirm negative expectancies and to better cope with distress (Zainal & Newman, 2019).

Strengths and Limitations

The present study has several limitations. First, our findings should be considered with some caution, as the relatively small sample size may have resulted in a lack of sufficient power and sensitivity to detect potential interaction effects. Especially, the analysis of the moderating variable intervention satisfaction was conducted only for the experimental group ($n = 60$). In addition, at pre-test, five participants with mild ID dropped out due to difficulties with the questionnaires, potentially contributing to a selection bias concerning the moderating variable of level of ID. Furthermore, research assistants were not blinded for condition. This may have caused a potential source for bias at the different measurement points for participants in the intervention group. Moreover, we cannot fully eliminate the risk that the responses of participants in the intervention group on the intervention satisfaction measure were partially due to their desire to please the trained researchers. In addition, the subscale mindset of emotion and behaviour suffered from modest internal reliability and therefore, caution is needed when interpreting the results. Another limitation is that we, in our attempt to create a more in-depth understanding why TGF works, only examined one mediator of TGF on mental health problems. Finally, we cannot rule out that effect sizes of TGF would have been different if we had used an active control group. However, previous research showed that a mindset intervention was more effective than both a passive (no intervention) as well as an active control condition (Aronson et al., 2002; Yeager et al., 2013). Despite these limitations the current study has several strengths. In particular, this research is a unique first attempt to expand the understanding of the working mechanisms of a mindset intervention for youth with ID. Specifically, examining perseverance as a potential mediating mechanism underlying mindset intervention effects, had not been done until now. Also, this study was the first to systematically examine who benefits the most from TGF by testing several moderators. A particular strength is the stringent

research design we used, a full scale randomised trial with repeated measurements with a sample of youth with ID from a “real-world” setting, including special education and residential care. Finally, due to the online approach, dissemination and implementation of TGF will be efficient and cost-effective and therefore TGF will be able to be used on large scale.

Clinical implications

The outcomes of the moderator analyses demonstrate that the online mindset intervention TGF is similarly effective for adolescents with diverse characteristics, with two exceptions regarding gender. Therefore, TGF can be used for a broad range of youth with ID and delivered widely across special education schools and residential care. In addition, the results underline the importance of both systematically monitoring and boosting intervention satisfaction in TGF and, might we speculate, in interventions in general. Clearly, there is a great need for more specific information about which intervention content, processes and types of interactions with the trainer influence satisfaction, suggesting the use of feedback-informed treatment (Miller et al., 2006). Additionally, feedback informed treatment as well as new intervention content designed to maximise relevance for youth experiencing externalising and internalising problems (e.g., even more specific social narratives of role models) may contribute to higher satisfaction levels among youths participating in the intervention, subsequently enhancing intervention effects (Binning et al., 2018; Limeri et al., 2020; Schleider & Weisz, 2018). Moreover, an additional program specifically developed for family members, mentors and clinicians might play a role in generalizing the effects in the long-run (Dweck & Yeager, 2019; Yeager & Dweck, 2020). Finally, TGF indirectly reduced internalising and externalising problems through improvements in perseverance, and this suggests that practitioners may be especially successful in decreasing those problems in youth with ID, by primarily encouraging effort, and offering strategies that help to persevere in the face of obstacles and challenges.

Future research

Further research is needed that is designed and powered to undertake moderator analyses to replicate our findings in order to allow for more firm conclusions and deepen the understanding of the moderating and mediating mechanisms of TGF and mindset interventions in general. Since our knowledge of these underlying mechanisms is still very limited, we encourage future research to continue to explore different mechanisms that might explain the effects of TGF. For example, the therapeutic relationship may partially account for the effect of TGF on internalising problems, since alliance has shown to play a key role in enhancing treatment outcomes (e.g., Shirk & Saiz, 1992). Moreover, randomised controlled trials with an active control group may help to identify more specific elements of TGF that induce effects (Schleider & Weisz et al., 2018). Better insight into the active intervention ingredients may also help to customise TGF to improve its effectiveness. Moreover, future research should include additional interim assessments during the course of the intervention for a more detailed insight into the process of change. Furthermore, it seems relevant to look into the bi-directional associations between perseverance and mental health problems, as multiple theories have

proposed how deficits in behavioural strategies, such as persevering despite setbacks, can precede, be a consequence of, or relate dynamically to mental health problems (Zainal & Newman, 2019). Finally, further investigations into other moderators, such as initial levels of perseverance and mental health problems, and parental support and coping style, might yield important discoveries (Zainal & Newman, 2019; Zhou et al., 2007).

Conclusion

This study demonstrated that the online mindset intervention TGF appears to be effective for a wide variety of youth with ID in increasing mindsets and perseverance, and reducing mental health problems. Furthermore, TGF was successful in decreasing externalising and internalising problems by promoting perseverance among youth with ID. Overall, our findings suggest that TGF can be used as a universal, “add-on” mindset intervention, complementing usual care programs improving growth mindsets, perseverance, and mental health in ID youth.

Supplementary Materials

Table 1
CONSORT-SPI 2018 Checklist

Section	Item	Consort-SPI 2010	Consort-SPI 2018	Page
Title and Abstract				
	1a	Identification as a randomised trial in the title		
	1b	Structured summary of trial design, methods, results, and conclusions	Refer to CONSORT extension for social and psychological intervention trial abstracts	2, 14
Introduction				
Background and Objectives	2a	Scientific background and explanation of rationale		5 - 8
	2b	Specific objectives or hypotheses	If pre-specified, how the intervention was hypothesised to work	8
Methods				
Trial Design	3a	Describe of trial design, including allocation ratio	If the unit of random assignment is not the individual, please refer to CONSORT for Cluster Randomized Trials	9
	3b	Important changes to methods after trial commencement		10
Participants	4a	Eligibility criteria for participant	When applicable, eligibility criteria for settings and those delivering the intervention	10
	4b	Settings and locations where the data were collected		9
Interventions	5	The interventions for each group with sufficient details to allow replication		9 - 12
	5a		Extent to which interventions were actually delivered by providers and taken up by participants as planned	10 Figure 1
	5b		Where other informational materials about delivering the intervention can be accessed	13
	5c		When applicable, how intervention providers were assigned to each group	9
Outcomes	6a	Completely defined pre-specified outcomes		11 - 14

	6b	Any changes to trial outcomes after the trial commenced, with reasons		
Sample size	7a	How sample size was determined		9
	7b	When applicable, explanation of any interim analyses and stopping guidelines		
Randomisation				
Sequence generation	8a	Method used to generate the random allocation sequence		9
	8b	Type of randomisation; detail of any restriction		
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence, describing any steps taken to conceal the sequence until interventions were assigned		9
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions		9 - 10
Awareness of assignment	11a	Who was aware of intervention assignment after allocation, and how any masking was done		10
	11b	If relevant, description of the similarity of interventions		
Analytical methods	12a	Statistical methods used to compare group outcomes	How missing data were handled, with details of any imputation method	13 - 14
	12b	Methods for additional analyses, such as subgroup analyses, adjusted analyses, and process evaluations		
Results				
Participant flow	13a	For each group, the numbers randomly assigned, receiving the intended intervention, and analysed for the outcomes	Where possible, the number approached, screened, and eligible prior to random assignment, with reasons for non-enrolment	Figure 1
	13b	For each group, losses and exclusions after randomisation, together with reasons		Figure 1
Recruitment	14a	Dates defining the periods of recruitment and follow-up		9, Figure 1
	14b	Why the trial ended or was stopped		
Baseline data	15	A table showing baseline characteristics for each group	Include socioeconomic variables where applicable	Tables 1 and 2

Numbers analysed	16	For each group, number included in each analysis and whether the analysis was by original assigned groups		Figure 1, Table 2
Outcomes and estimation	17a	For each outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Indicate availability of trial data	15, 16, Figures 1-4, Table 1-4
	17b	For binary outcomes, the presentation of both absolute and relative effect sizes is recommended		
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses, adjusted analyses, and process evaluations, distinguishing pre-specified from exploratory		12 - 13
Harms	19	All important harms or unintended effects in each group		
Discussion				
Limitations	20	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	17 - 20
Generalisability	21	Discuss the limitations of the scoping review process	Generalisability (external validity, applicability) of the trial findings17-20	17 - 22
Interpretation	22	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17 - 20
Important Information				
Registration	23	Registration number and name of trial registry		9 - 22
Protocol	24	Where the full trial protocol can be accessed, if available		23
Declaration of Interests	25	Sources of funding and other support; role of funders	Declaration of any other potential interests	23
Stakeholder investments	26a		Any involvement of the intervention developer in the design, conduct, analysis, or reporting of the trial	23
	26b		Other stakeholder involvement in trial design, conduct, or analyses	
	26c		Incentives offered as part of the trial	

Chapter 7

General discussion



The main goal of this thesis was to extend the knowledge about the concept of mindset in youth with mild to borderline intellectual disabilities (IQ 50–85) by (1) examining mindset and its association with psychosocial functioning, and (2) examining the feasibility, satisfaction, and effects of the newly developed online mindset intervention The Growth Factory. In this chapter the main findings will be presented and discussed. It also points out some limitations of the present research and implications for both clinical practice and future research will be provided.

Summary of Main Findings

In this dissertation, mindset is defined as *'the fundamental belief in the malleability of personal traits and attributes, such as intelligence, personality, and behavior'* (Dweck, 1999). On a continuum, and varying across domains, people can either hold a more fixed mindset or a mindset that leans more toward growth. People with a fixed mindset believe personal attributes are innate and uncontrollable, while people with a growth mindset assume that these attributes are dynamic and can be developed over time (Dweck, 1999; Dweck & Leggett, 1988; Molden & Dweck, 2006). Overall, previous research showed that people with a growth mindset generally show better academic and psychosocial functioning, such as better mental health outcomes, than people with fixed beliefs (e.g., De Castella et al., 2013; Robins & Pals, 2002; Romero et al., 2014; Schroder et al., 2015; Tamir et al., 2007, and for meta-analyses, see Burnette et al., 2020; Schleider et al., 2015). Research also demonstrated that mindset interventions teaching a growth mindset generally contributed to a more optimal psychosocial functioning of youth (e.g., Burnette et al., 2020; Miu & Yeager, 2015; Schleider & Weisz, 2016b; Yeager et al., 2013). However, little is known about mindset as a concept in people with intellectual disabilities and research into the effectiveness of mindset interventions tailored for this population is non-existent. Because of the elevated levels of mental health problems in youth with intellectual disabilities and the unfavorable consequences for youth themselves and their environment (e.g., Didden, 2005; Einfeld et al., 2011; Heyveart et al., 2010), it is of major interest to investigate the concept of mindset and effectiveness of a mindset intervention in this at-risk population. In our studies, with the term mindset we refer to the mindset domains 'intelligence', and 'emotion and behavior', as well as the closely related concept perseverance.

Mindset and Psychosocial Functioning in Youth with Intellectual Disabilities

Chapter 2 presented a study that examined mindsets and its relation with psychosocial functioning in youth with intellectual disabilities by (1) investigating potential differences in mindsets between adolescents with and without intellectual disabilities, (2) examining the differences in mindsets within the group of youth with intellectual disabilities, differentiating between intelligence level, gender, problem type, and age, and (3) exploring the associations between mindsets and perseverance on the one hand and psychosocial functioning (i.e., empowerment, mental health problems, and self-esteem) on the other within the group of youth with intellectual disabilities. In this

study, 247 youths with intellectual disabilities and comorbid physical disabilities and/or psychiatric problems ($M_{age} = 15.5$ years, $SD = 1.8$) were recruited from a residential care institution and six special education schools in the Netherlands. In addition, 96 youths without intellectual disabilities ($M_{age} = 14.7$ years, $SD = 1.4$) from a regular secondary school participated. All participants completed self-report questionnaires about mindsets, perseverance, and psychosocial functioning. Results showed that youth with intellectual disabilities were more likely to endorse a fixed mindset of emotion and behavior than their peers without intellectual disabilities. Moreover, we found mindset and perseverance differences within the group of youth with intellectual disabilities: youth with mild intellectual disabilities (IQ 50–69) were more likely to hold a fixed mindset of intelligence than youth with borderline intellectual functioning (IQ 70–85). In addition, boys with intellectual disabilities reported higher levels of perseverance than intellectually disabled girls. Furthermore, youth with intellectual disabilities and multiple comorbidities (i.e., physical disabilities and psychiatric problems) were more likely to report a fixed mindset of emotion and behavior compared to youth with intellectual disabilities and only co-occurring physical disabilities. Finally, we found that mindset of emotion and behavior and perseverance, but not mindset of intelligence, were related to psychosocial functioning. More specifically, a growth mindset was associated with higher levels of empowerment and self-esteem, as well as to lower levels of internalizing, externalizing, attention, and total mental health problems. These findings underscore the importance of a growth mindset for psychosocial functioning in youth with intellectual disabilities, and suggest that teaching youth with intellectual disabilities a growth mindset of emotion and behavior may be a successful endeavor to improve psychosocial functioning in this at-risk population.

The Growth Factory: Effectiveness

In **Chapter 3, 4, 5, and 6** the development of the online mindset intervention The Growth Factory is described. The Growth Factory builds on scientific research on implicit self-theories and mindset interventions by Carol Dweck and David Yeager (Dweck, 1999; Yeager et al., 2013, 2016). The intervention is designed for 12 to 23 years old youth with intellectual disabilities aiming to enhance a growth mindset and subsequently impacting their psychosocial functioning. Youth participate in the six sessions and a booster session under guidance of a trained research assistant. The sessions take up 30–40 minutes each and are structured around the key growth mindset affirmations (Dweck, 1999; Yeager & Dweck, 2012), by emphasizing: (1) the potential for brain plasticity, (2) the assumption that one's characteristics are malleable and have the potential to change, (3) that people are personally in charge of this process by teaching the formula for successful change: effort, strategies, and help from others, and (4) that change is neither easy nor certain and may only happen over time—but is usually possible. Besides the use of animations, interactive assignments, movie clips of successful role models, and “saying-is-believing” exercises, The Growth Factory contains exercises based on the principles of cognitive behavioral therapy (Aronson et al., 2002; Yeager & Walton, 2011). In addition, role play, biweekly reminders, and homework assignments were integrated, as for people with intellectual disabilities new learning needs practice and repetition to become established (De Wit et al., 2011).

In **Chapter 3** results were presented from a pilot randomized controlled study specifically designed to obtain preliminary insights into feasibility, satisfaction, and effectiveness of the new online mindset intervention The Growth Factory and to further improve the intervention. In total, 59 youth with intellectual disabilities and/or mental health problems (M_{age} 14.53, $SD = 1.58$; range 12–18) were recruited from a Dutch special education school and randomly assigned to the intervention ($n = 29$) or control ($n = 30$) group. The majority of youth (87%) had a mild to borderline intellectual disability. All youths completed questionnaires about mindsets, perseverance and psychosocial functioning (i.e., empowerment, coping, self-esteem, and internalizing and externalizing problems) at baseline, post-intervention, and follow-up at 3 and 6 months. The pilot showed promising results in terms of feasibility for the target group and user satisfaction. In particular, The Growth Factory was completed and positively evaluated by the majority of participants. In addition, the intervention was effective in improving a growth mindset of intelligence at short-term ($d = 0.61$) and in improving empowerment at short to mid-term ($d = 0.61$; $d = 0.52$, respectively), but the intervention was found to have no effect on coping, self-esteem, and internalizing and externalizing problems in youth with emotional and behavioral difficulties and/or an intellectual disability.

To increase the effectiveness and treatment adherence, pilot findings were used to make some important changes to further improve The Growth Factory, including the correction of technical errors, the option to skip the repetitions of the animation, the addition of a participant workbook, two assignments practicing and discussing the relationship between cognition, feelings and behavior, and a detailed manual for assistants. The support offered by the assistant shifted from ‘participants completing the session as independently as possible’ to ‘offering guidance to ensure the core message of the session was understood’. In sum, the pilot study contributed to the field by developing and testing a new innovative online mindset intervention for a highly clinically relevant group of youth. Results provided some preliminary evidence that The Growth Factory is a promising new intervention for youth with emotional and behavioral disorders often combined with intellectual disabilities and gave reason to further examine effectiveness of the improved The Growth Factory in a full scale randomized controlled trial.

In **Chapter 4**, the study protocol of the randomized controlled trial for the effectiveness of The Growth Factory for youth with mild to borderline intellectual disabilities and comorbid physical and/or psychiatric problems was presented. In this chapter, the background, hypotheses, design, sample and recruitment, procedure, intervention The Growth Factory, outcome measures and statistical analyses were described. The main hypotheses specified were that The Growth Factory would increase growth mindsets, perseverance, and psychosocial functioning including empowerment, mental health, and self-esteem, as well as more common treatment factors therapeutic alliance and treatment motivation (Chapter 5). We additionally examined hypotheses of moderating and mediating factors of change in Chapter 6.

The randomized controlled trial of The Growth Factory, presented in **Chapter 5**, was the first study conducted into the effectiveness of an online mindset intervention for youth

with intellectual disabilities. The aim of the current study was to examine participant satisfaction and effectiveness of the online mindset intervention The Growth Factory for youth with intellectual disabilities. In total, 119 youths ($M_{age} = 15.83$ years, $SD = 2.23$) with mild to borderline intellectual disabilities ($M_{IQ} = 66.41$, $SD = 9.54$) were recruited from six special education schools and a residential care institution in the Netherlands. The majority of participants were diagnosed with comorbid physical and/or psychiatric problems. Participants were randomly assigned to the intervention ($n = 59$) or control group ($n = 60$). Participants in the intervention group participated individually in the six sessions and a booster session of The Growth Factory under guidance of a trained research assistant in addition to their school curriculum or usual care program. Participants in the control group attended the school curriculum or care as usual. All youth completed assessments at pre-test, post-test, and at 3 months and 6 months follow-up about mindset of intelligence, mindset of emotion and behavior, perseverance, psychosocial functioning (i.e., empowerment, self-esteem, mental health problems) and general treatment factors (i.e., therapeutic alliance and treatment motivation). Findings revealed that The Growth Factory was positively evaluated by the majority of the participants on both quantitative and qualitative satisfaction measures. In addition, The Growth Factory was effective in increasing perseverance ($d = 0.43$) and self-esteem ($d = 0.08$), and in decreasing internalizing problems ($d = -0.39$), attention problems ($d = -0.40$), and total mental health problems ($d = -0.38$) immediately after the intervention. In addition, the study found that The Growth Factory was effective in increasing therapeutic alliance. More specifically, The Growth Factory had an effect in neutralizing the decrease in participants' collaboration with their mentor ($d = 0.26$). The effects on mental health problems sustained at 3 months follow-up for internalizing problems ($d = -0.47$), attention problems ($d = -0.38$), and total mental health problems ($d = -0.44$), but not at 6 months follow-up—this latter finding was explained by improvements in the control group. Furthermore, The Growth Factory had significant follow-up effects on mindset of intelligence at 3 months ($d = 0.26$) and 6 months ($d = 0.30$), and mindset of emotion and behavior at 6 months after the intervention ($d = 0.02$). The Growth Factory did not have significant effects on empowerment, externalizing problems, treatment motivation and therapeutic alliance (i.e., affective bond and total). Overall, the results provided evidence that The Growth Factory offers a promising add-on intervention complementing usual care programs by improving mindsets, perseverance, self-esteem, and mental health in youth with intellectual disabilities.

The Growth Factory: Moderation and Mechanisms of Change

Chapter 6 was a further elaboration of Chapter 5 and provided a more in-depth understanding for *whom* and *why* The Growth Factory works. The objectives of the study were to investigate baseline mindsets, gender, age, level of intellectual disability, and intervention satisfaction as moderators of The Growth Factory effectiveness, and to examine perseverance as a mediator of intervention effects on mental health problems. With regard to moderation, results indicated that the effectiveness of The Growth Factory was not moderated by age, baseline mindsets, and level of intellectual functioning. Intervention satisfaction and gender *did* moderate the effects of the intervention. Specifically, intervention effects with respect to reducing internalizing, externalizing, and

total mental health problems were stronger for adolescents who were more satisfied about the intervention compared to those with lower satisfaction scores. Moreover, The Growth Factory was more effective in reducing internalizing problems in girls and more effective in increasing perseverance in boys. In addition, we found that The Growth Factory indirectly reduced internalizing and externalizing mental health problems at 3 months follow-up through improvements in perseverance at post-test. In sum, these findings indicate that The Growth Factory appears to be effective for a wide variety of youth with intellectual disabilities in increasing mindsets and perseverance, and reducing mental health problems through improved perseverance.

To conclude, the findings in this dissertation demonstrated that youth with intellectual disabilities are more likely to endorse a fixed mindset of emotion and behavior compared to peers without intellectual disabilities, and demonstrated that youth with intellectual disabilities who endorsed such a fixed mindset reported more problems in psychosocial functioning. Furthermore, the current dissertation demonstrated that an online mindset intervention developed for youth with intellectual disabilities (1) was feasible in a special education setting and residential health care organization and positively evaluated by the majority of participants, and (2) had beneficial effects on mindsets, perseverance, self-esteem, collaboration and mental health. In the next part of the discussion we will reflect on the findings of this dissertation.

Reflections on Main Findings

Mindset Differences between Youth with and without Intellectual Disabilities

Over the past years, research on mindsets and its association with psychosocial functioning in the general population has accumulated (Burnette et al., 2020; Schleider et al., 2015). However, limited research has been conducted into the growth mindset concept and its potentially beneficial effects on mental health in people with intellectual disabilities. As far as we know, our study is the first attempt to examine mindset differences between youth with and without intellectual disabilities in a Dutch sample. In addition, studies investigating the specific domain of emotions and behaviors among youth with and without intellectual disabilities are non-existent. We found that youth with intellectual disabilities are more likely than their non-disabled peers to hold a fixed mindset of emotion and behavior. This may be explained in line with presumptions of De Castella and colleagues (2014) and Schroder and colleagues (2015) who suggest that individuals struggling with their emotions and behaviors, such as youth with intellectual disabilities often do, are more likely to develop a fixed mindset, as they might experience troubling feelings and behaviors as difficult or even impossible to change. Furthermore, repeated experience with uncontrollable events and aversive emotional reactions may also reinforce beliefs that one's emotions and behaviors are outside of their control (De Castella et al., 2014; Schroder et al., 2015). Indeed, previous research indicated that youth with intellectual disabilities experience more negative life events (e.g., parental separation,

financial crisis) and experience daily stressors as more impactful compared to peers without intellectual disabilities (Bramston et al., 1999; Hatton & Emerson, 2004).

However, our findings were also partly inconsistent with the few studies available comparing mindset of intelligence between youth with and without intellectual disabilities (Baird et al., 2009; Koestner et al., 1995). More specifically, we did not observe a difference in mindset of intelligence between youth with and without intellectual disabilities. Several explanations come to mind for the absence of these differences. First, youth with intellectual disabilities in our sample were recruited from special education schools instead of regular classrooms (Baird et al., 2009). This context might have reduced the risk of being exposed to overly demanding cognitive tasks, higher achieving classmates, awareness of being identified as *intellectually* disabled, and downward social comparison (Gacek et al., 2017; Szumski & Karwowski, 2015). This may have resulted in a relatively higher academic self-concept and more growth-oriented mindset among youth with intellectual disabilities in our sample. In contrast, youth without intellectual disabilities in our sample attended education in the lowest ability stream (VMBO) in their secondary school. Therefore, they may have suffered more from processes of downward social comparison which might contribute in a more fixed mindset (Baird et al., 2009; Ireson et al., 2001; Oakes, 1985; Szumski & Karwowski, 2015). Consequently, fixed beliefs regarding whether or not their intelligence can change might have been more evident in our sample, among youth without intellectual disabilities compared to youth with intellectual disabilities in our sample. Finally, differences in the measurement of a mindset of intelligence may account for the different findings in our study and previous research. For example, in the current study, three first-person fixed statements (i.e., personal intelligence as unchangeable) were used for measuring mindset of intelligence, whereas Koestner and colleagues (1995) interpreted the results on an eight items questionnaire assessing participants attributional style for failure as evidence for this concept.

Mindset Differences within Youth with Intellectual Disabilities

Another important observation was that within the group of youth with intellectual disabilities, there were some differences in the extent to which youth endorsed growth mindsets and perseverance (Chapter 2). Our findings revealed that youth with mild intellectual disabilities were more likely to endorse a fixed mindset of intelligence compared to peers with borderline intellectual functioning. This could be explained by the fact that, in the Netherlands, youth with intellectual disabilities attending special education are encouraged to attend internships in regular settings and social enterprises (Van Leeuwen et al., 2009). It has been broadly acknowledged that supported, inclusive employment can promote independence, quality of life, and social integration for people with intellectual disabilities (Van Leeuwen et al., 2009). Youth with borderline intellectual functioning are more likely to participate in regular internships, and therefore, might be more likely to adopt a growth view about the malleability of their intelligence compared to peers with mild intellectual disabilities.

Notably, in line with previous studies among youth without intellectual disabilities (e.g., Dweck et al., 1980), boys with intellectual disabilities reported higher levels of perseverance than intellectual disabled girls. A possible explanation might be the contrasting experiences boys and girls have with praise and feedback (Dweck et al., 1980; Gunderson et al., 2018). For example, teachers attribute boys' failures to a lack of motivation more often than they do for girls and therefore, boys are more likely to blame their effort instead of their ability (Dweck et al., 1980).

Another interesting finding was that youth with intellectual disabilities and multiple comorbidities (i.e., physical disabilities and psychiatric problems) were more likely to report a fixed mindset of emotion and behavior compared to youth with intellectual disabilities and only co-occurring physical disabilities. This could be explained by the strong relationship between psychiatric disorders and mental health problems in youth with intellectual disabilities (e.g., Myrbakk & von Tetzchner, 2008). As youth with more severe and persistent emotional and behavioral problems are more likely to experience difficulty in controlling and altering their troubling feelings and behaviors despite continued effort (Schleider & Weisz, 2016a; Tamir et al., 2007), it seems plausible that youth with intellectual disabilities and multiple comorbidities are more likely to develop a fixed mindset of emotion and behavior. In addition, our findings support the alternative hypothesis that mental health problems might also precede increases in fixed mindsets (Schleider & Weisz, 2016a, 2016c).

Mindset and Mental Health

Previous research provided evidence for the association between mindset and psychosocial functioning in the general population (e.g., Burnette et al., 2020; Robins & Pals, 2002; Schleider et al., 2015; Tamir et al., 2007). Our findings partly corroborated this relationship in youth with intellectual disabilities. Indeed, our results showed that a growth mindset of emotion and behavior was associated with stronger feelings of self-esteem, and with lower levels of internalizing, externalizing, attention, and total mental health problems. However, in contrast to some studies among youth without intellectual disabilities (e.g., Da Fonesca et al., 2008; Robins & Pals, 2002), the current study did not support the hypothesis that mindset of intelligence is related to mental health outcomes among youth with intellectual disabilities. This outcome is in accordance with some individual studies suggesting that certain mindset domains might be especially linked to specific youth problems (Schroder et al., 2015; Tamir et al., 2007; Yeager et al., 2013, Yeager, Miu et al., 2013) and with findings of a recently published meta-analysis (Burnette et al., 2020) showing that a fixed mindset of emotion is more strongly related to mental health problems than a fixed mindset of intelligence. This might not be surprising given the pervasive impact of emotions on human psychological and social functioning thereby suggesting that developing interventions that target mindset more specific to particular psychopathology could maximize the mental health benefits (Kneeland et al., 2016; Schroder et al., 2015; Tamir et al., 2007).

Mindset Intervention for Youth with Intellectual Disabilities

Our findings are in line with previous research on the effects of mindset interventions for youth without intellectual disabilities, indicating that mindset interventions can also be effective for youth with intellectual disabilities. Findings from our randomized controlled trial demonstrated that The Growth Factory was effective in increasing perseverance and self-esteem, in decreasing internalizing, attention, and total mental health problems, and in maintaining participants' collaboration with their mentor immediately after the intervention. The effects on mental health problems sustained until 3 months after the intervention. In addition, The Growth Factory had follow-up effects on mindset of intelligence (at 3 and 6 months follow-up), and—albeit a minimum effect—on mindset of emotion and behavior (at 6 months follow-up). Although some of the effect sizes seem relatively small, some scholars argue that in a real-world context, effects that are small by Cohen's standards are large relative to the impacts of most field-based interventions (Burnette et al., 2020; Dweck & Yeager, 2019; Kraft, 2020; Yeager & Dweck, 2020). In addition, it is suggested that it is more likely to find larger effects on outcomes that are easier to change (Kraft, 2020). Because mindsets tend to be deeply held (Robins & Pals, 2002) and thinking, processing information, and learning occur at a slower rate in people with intellectual disabilities, our growth mindset intervention effect sizes, occurred within a short, low-cost intervention, and therefore, seem relevant and meaningful. Finally, in line with Prentice and Miller (1992), our results could thus still be considered important, since the intervention accounts for significant variance while the manipulation was minimal and the outcome difficult to influence.

The intervention effects are particularly important for our target group of youth with intellectual disabilities, as their mental health needs are multiple, complex and persistent, and often inadequately met (Kolaitis, 2008). Although mental health problems have traditionally been approached with disorder specific interventions, our findings suggest that targeting underlying maladaptive core assumptions could be a successful approach to treat mental health problems in this at-risk population. In addition, our findings extend previous research indicating a positive impact on the therapeutic relationship in a special education or care setting. This suggests that The Growth Factory is a promising approach to maintain a positive alliance between youth with intellectual disabilities and their mentor, which may subsequently enhance treatment outcomes (Shirk & Saiz, 1992).

While previous research showed mindset interventions might be effective in increasing feelings of empowerment and treatment motivation, our results demonstrated null-effects on these outcome variables (e.g., Miu & Yeager, 2015; Schleider & Weisz, 2016b). One potential reason for this may be that the effect of shifting mindsets was not strong enough to lead to downstream changes in these outcomes (Burnette et al., 2018). Another potential explanation could be the focus of The Growth Factory, which was aimed at promoting a growth mindset and perseverance and also explicitly at addressing the potential beneficial effects on emotions and behaviors, but not on the other outco-

mes. Thus, added material may be necessary to enhance the potency of The Growth Factory on the other outcomes (Burnette et al., 2018). Finally, individual studies reporting on mindset interventions often show promising findings, moreover, a small sample meta-analysis aggregating the mindset intervention effects, showed a small effect of mindset interventions on psychological distress ($d = 0.22$; Burnette et al., 2020).

Mindset Interventions: Follow-Up Effects

Previous studies showed short to long-term effects on depressive and anxiety symptoms, self-esteem, conduct problems, stress, health, and grades for youth without intellectual disabilities (Da Fonseca et al., 2008; Miu & Yeager, 2015; Schleider et al., 2016b; Yeager et al., 2013, 2014). Yet, little is known about the longer-term impact of mindset interventions on mindsets. In contrast to previous intervention studies, our study did not show that The Growth Factory was effective in increasing growth mindsets immediately after the intervention (e.g., Paunesku et al., 2015; Yeager et al., 2016). Perhaps the most intriguing results, however, pertained to the effects on mindsets at 3 (intelligence) and 6 months (intelligence and emotion and behavior) follow-up. The null effects on mindsets immediately after the intervention support the hypothesis that because mindsets tend to be deeply held (Robins & Pals, 2002) and because thinking, processing information, and learning occur at a slower rate in people with intellectual disabilities, mindset effects may need more time to be internalized by this population leading to gradually increased intervention effects over time; so-called sleeper-effects (Van Aar et al., 2017).

Related to the issue of sustained effects, previous research demonstrated the alternate possibility that mental health problems may also predict increases in fixed mindsets (Schleider & Weisz, 2016a). In addition, a longitudinal study in the academic domain recently provided evidence for a feedback loop, showing that mindsets not only influenced student's perceptions of their academic performance, but also that students reported that their academic performance influenced their mindsets (Limeri et al., 2020). Building on these results, it may be possible that The Growth Factory effects on mindsets come later, only after The Growth Factory first leads to a decrease in mental health problems. Mindset interventions may influence youth by asking them to reflect on past experiences when they have learned to overcome a struggle, reminding them that they are capable of doing so. In this way, interventions may tap into and capitalize on the positive feedback loop between mindset beliefs and mental health (Limeri et al., 2020). In our study, The Growth Factory effects on mental health problems were sustained until 3 months follow-up but not 6 months follow-up. However, it should be taken into consideration that the null effects at 6 months follow-up were not driven by an increase in mental health problems in the intervention group. Instead, these null effects were driven by a remarkable decrease in mental health problems in the control group at 6 months follow-up. Research investigating the effectiveness of institutional general care suggests that mental health problems tend to weaken during care (Geurts et al., 2010; Knorth et al., 2008). Thus, the present results suggest that The Growth Factory may have accelerated this normative development in a special education or care setting.

Moderators and Mediators of Mindset Intervention Effects

Youth with intellectual disabilities should be considered a heterogeneous population with varying levels and presentations of comorbid problems and different clinical expressions and severity rates. Moderation analyses revealed that the effectiveness of The Growth Factory was not affected by participants' baseline mindsets, age, and severity level of intellectual disability (Chapter 6). Our findings are in line with previous studies showing that mindset interventions reduced aggression, stress, and health regardless of baseline mindset (Broda et al., 2018; Yeager et al., 2013, 2014). Furthermore, no research has yet examined the role of severity level of intellectual disability and intervention satisfaction in the effectiveness of mindset interventions. Our findings are in line with previous research that showed that mindset interventions improved mental health in youth with diverse characteristics, such as race differences, different developmental stages, socio-economic status, and academic risk status (e.g., Paunesku et al., 2015; Sisk et al., 2018; Yeager et al., 2011). A possible explanation for the fact that the effects of the mindset intervention The Growth Factory generalizes across different youth might be that The Growth Factory aims to optimize the fit between participants with diverse characteristics and the intervention. In developing The Growth Factory, special care was taken to increase the likelihood that participants would identify with one of the avatars or 'buddies' by creating avatars with different characteristics and by creating role models in the video-clips whose stories and struggles matched those oftentimes reported by youth with intellectual disabilities and professionals (Binning et al., 2018; Yeager & Walton, 2011). Additionally, youth were allowed to personalize their responses (e.g., by choosing their own topic in an assignment), so intervention materials evoked the intended experience in the way that was most relevant to them (Yeager & Walton, 2011). Finally, the online approach provided the opportunity to adjust the level of support and repetition increasing the probability to address participants' individual information processing needs (De Wit et al., 2011). Our moderator analyses were based on a small sample and therefore should be interpreted with caution, but the findings do suggest that (a) The Growth Factory can be delivered widely to students in residential care organizations and special education schools, and (b) growth mindsets are equally malleable, with two exceptions regarding gender, and important for these subgroups of youth with intellectual disabilities.

As far as we know, no previous mindset intervention study examined perseverance as possible mediator of mindset intervention effects on mental health. Our study demonstrated that, although there was no direct effect of The Growth Factory on externalizing problems, The Growth Factory did indirectly reduce internalizing and externalizing problems at 3 months follow-up through improvements in perseverance reported at post-test. One potential explanation for this finding is that teaching people to tolerate challenges and failures toward goal achievement increases their awareness of how their daily actions and habits are instrumental in achieving goals and changing emotions and behavior (Zainal & Newman, 2019). Moreover, The Growth Factory encourages participants to cope with obstacles and challenges by putting in effort, exploring different strategies, and to ask for help. This may have helped The Growth Factory participants

to disconfirm negative expectancies and to better cope with distress (Zainal & Newman, 2019). With respect to clinical practice, our findings suggest that practitioners may be especially successful in decreasing externalizing problems in youth with intellectual disabilities encouraging effort, and offering strategies to help youth to persevere when facing obstacles and challenges.

Limitations

Despite the strengths of our current research approach, several limitations warrant caution in the interpretation and generalization of our results. A first set of limitations concerns some assessments used in the current thesis. In particular, to measure mindset and perseverance in youth with intellectual disabilities we designed and introduced the Mindset and Perseverance Questionnaire (MPQ, Verberg et al., 2019). However, the subscale mindset of emotion and behavior had only modest internal reliability throughout our studies. This may have resulted in biased estimates of intervention effects due to a loss of power to detect such effects. Future psychometric research could focus on improving the measurement of the mindset concept in youth with intellectual disabilities. Moreover, other questionnaires used in this thesis, such as the ones on empowerment, mental health problems, treatment motivation, and therapeutic alliance were not specifically designed for adolescents with intellectual disabilities. Although we made sure to simplify and adapt the questionnaire content to our sample's needs, and internal reliabilities were sufficient, future research should examine the psychometric properties of the questionnaires in the population of people with intellectual disabilities in more detail.

Further, mentors completed questionnaires about mindsets, perseverance, empowerment, and mental health problems, however, there was a large proportion of non-response despite reminders. Therefore, the mentor-responses were not analysed due to a lack of statistical power. Unfortunately, this did not allow us to strengthen our conclusions about The Growth Factory effects using a multi-informant analysis. To increase mentor-response rates in future research efforts, we suggest engaging mentors at an early stage in the planning and implementation to create an understanding of why the school or institution was implementing practices and to ensure mentors belief in the approach. Ultimately, this may create commitment and collaboration (Fraser, 2018; Yeager et al. 2019; Yeager & Walton, 2011). In addition, we also suggest to include mentors in participation in The Growth Factory, which will likely also increase their commitment (see also clinical implications).

Another point of consideration is the lack of an active control condition in our randomized controlled trial (Chapter 5 and 6). In addition, our results may be impacted by the ambiguities in care as usual across different settings and between schools. Although previous research showed that a mindset intervention was more effective than both a passive (no intervention) as well as an active control condition (Aronson et al., 2002; Schleider & Weisz, 2018; Yeager et al., 2013, 2014), we cannot exclude the possibility

that perhaps effect sizes of The Growth Factory would have been different if we had used an attention-matched control group. To do so, replication studies could include more participants with intellectual disabilities involved in an active control condition, working with active control materials or procedures, this would strengthen the conclusion that the perceived effects are due to the mindset intervention and not only caused by the individual attention of a research assistant.

Clinical Implications and Future Research

Based on the studies presented in this dissertation, The Growth Factory has the potential to be a promising addition to current available care and education for adolescents with intellectual disabilities. Several clinical implications and implications for future research can be sketched out to (1) improve the short and long term effectiveness of The Growth Factory, and (2) implement and scale up The Growth Factory in the most optimal way. First, a suggestion to improve the effectiveness of The Growth Factory is to focus on the 'mindset environment' and build growth mindset cultures (Dweck & Yeager, 2019, 2020; Walton & Yeager, 2020). The Growth Factory solely focused on youth with intellectual disabilities, whereas it is of particular interest to investigate the mindset conveyed by or embodied in the environments that youth are in and what role family members, mentors and clinicians can play in generalizing the effects in the long-run. Recently, research demonstrated that contexts can embody a mindset and this is a potentially powerful force in shaping the beliefs of people in those environments (Murphy & Dweck, 2010; Yeager et al., 2019). Especially for youth with intellectual disabilities the environment plays a crucial role in integrating and upholding intervention effects (De Wit et al., 2011).

A second point in increasing effectiveness of The Growth Factory is to improve the interventions content. First, it is of particular importance to include active ingredients. Our findings suggest that it may be useful to directly address participants' beliefs about the degree to which their problematic and distressing emotions and behaviors are malleable through their efforts, by seeking help from others, and by trying new strategies. In addition, new learning needs more practice and repetition to become established in youth with intellectual disabilities (De Wit et al., 2011; Douma et al., 2012). Therefore, it may be necessary for youth with intellectual disabilities to receive additional growth mindset practice moments (in collaboration with someone in their daily environment) and extended booster sessions to boost and uphold the initial intervention effects and engender long-term changes (Campbell et al., 2014).

Third, although attrition in our studies was relatively low, it is of interest to prevent drop-outs. Participants that dropped out of our intervention study scored significantly higher at pre-test on externalizing problems (pilot), whereas in the randomized controlled trial drop-outs scored significantly lower on perseverance than completers. Therefore, to maximize the engagement and participation for these subgroups it might help to include more specific social narratives of role models struggling with perseverance and

externalizing behavior problems and the various strategies that they used to overcome these challenges (Binning et al., 2018; Limeri et al., 2020; Schleider & Weisz, 2018). Moreover, the intervention assistants could be given a key role in signalling and anticipating on dissatisfaction and motivational problems by involving the mentor teacher and/or parents. In addition, it might be important to add motivational interviewing techniques to the training for trainers so they can apply this to evoke hope and confidence to enhance behavior change (Burnette et al., 2020).

Fourth, in our randomized controlled trial pilot and study we solicited feedback from participants to get a better understanding about participant's satisfaction with the intervention using an adapted form of the Session Rating Scale. However, we did not use the information provided by participants on the Session Rating Scale to optimize the treatment process and outcomes of that specific participant. Feedback informed treatment may contribute to higher satisfaction levels among youth participating in the intervention, subsequently enhancing intervention effects (Miller et al., 2006). Therefore, it is suggested not only to use the Session Rating Scale as a research tool, but also as a clinical tool to improve the therapeutic alliance between youth and trainer.

Several potential avenues for future research can be sketched out. First, future research could attempt to replicate clinical mindset interventions studies for youth with intellectual disabilities to allow for more firm conclusions about the short term and long term effects. Clearly, randomized controlled trials with sufficient statistical power are needed to establish the efficacy of mindset interventions in adolescents with intellectual disabilities. In addition, when The Growth Factory would be further improved it would be of great interest to examine whether the adaptations indeed result in a more effective intervention. Better insight into the active intervention ingredients may also help to improve its effectiveness. For example, conducting user-centered design experiments and thereby beginning with the original materials and using a design methodology to increase the likelihood that these materials actually conveyed the intended meaning in the new targeted population. Moreover, conducting well-powered randomized experiments in advance to ensure the materials will be appropriate and effective in the target population (Yeager et al., 2016). Second, research could focus on deepening our understanding of mediating and moderating factors of mindset interventions. For example, further investigations might elaborate on the moderating effect of particular psychiatric diagnoses, such as depression and anxiety. Previous research showed that the presence of psychopathology in individuals, in particular internalizing problems, predicted subsequent increases in fixed mindset over time (Schleider & Weisz, 2016a). In addition, the therapeutic relationship may partially account for the effects of The Growth Factory on mental health problems. Moreover, previous research demonstrated that a growth mindset is related to an adaptive coping style which in turn was related to less internalizing and externalizing problems in adolescents (Rosenberg et al., 2016). Therefore, the relationship between mindset and mental health problems might also be mediated through coping, another mechanisms that needs further investigation (De Castella et al., 2013). Finally, in the current work we examined the hypothesis that mindsets influence psychosocial functioning, however, research has also demonstrated that

psychosocial functioning impacts mindset (Burnette et al., 2020; Schleider & Weisz, 2016a). In particular, mindsets likely also change as a function of personal experiences, supporting dynamic relations between mental health and mindset of emotion and behavior (Burnette et al., 2020; Schleider & Weisz, 2016a). In a study between adolescents with and without intellectual disabilities, the cognitive bias ‘underestimation of the ability to cope’ was the only cognitive error related to depressive symptoms, and was much more prevalent among adolescents with intellectual disabilities than without intellectual disabilities (Weeland et al., 2017). Researchers could incorporate longitudinal studies with multiple time points to better tease apart the “which came first” question (Burnette et al., 2020).

Implementation and Scalability

Based on the findings in this dissertation, we conclude that The Growth Factory can be delivered widely across special education schools and health care organizations, at relatively low costs and in efficient ways due to the online and structured format. However, previous research highlighted the complexity of implementing interventions in heterogeneous contexts (Broda et al., 2018; Dweck & Yeager, 2020; Oates et al., 2020; Yeager & Walton, 2011; Yeager et al., 2016), and therefore, it is important to reflect on how The Growth Factory can be scaled up and implemented in the most optimal way.

First, basic preconditions such as the availability of digital devices, an online helpdesk, up-to-date treatment protocols for clinicians, mentors, and parents, and classroom management may be necessary for an online intervention to succeed (Dweck & Yeager, 2019). Another point of consideration in scaling up is the maintenance of quality of implementation, such as certification of trainers and executing the intervention with sufficient fidelity. In particular, clinicians providing the intervention should be trained and guided to prevent the implementation of *false growth mindsets*, for example by praising effort even when the student’s effort is not effective (Dweck & Yeager, 2019), and to adopt more of a growth mindset themselves if they are going to successfully convince and teach youth the concept of mindset (Dweck & Yeager, 2019; Foliano et al., 2019; Yeager & Dweck, 2020). In our studies, research assistants had a bachelor or master degree and participated in four 2-hour training sessions, but were relatively unexperienced in working with youth with intellectual disabilities and comorbid problems. We believe that the structured online format of The Growth Factory has contributed to implementing the intervention with sufficient fidelity. Training more experienced clinicians to gain an accurate understanding of a growth mindset and its principles, and develop teaching practices that embody it and communicate it to participants together with the intervention’s structured format may even increase The Growth Factory effectiveness (Dweck & Yeager, 2019).

Second, another point in view of a possible implementation of The Growth Factory in everyday clinical practice, is the use of a *group or class format*. The Growth Factory was designed to be individually delivered by an assistant in the form of six sessions, once a

week during six consecutive weeks. However, larger group teaching may be more realistic for real life application in schools, since many schools do not have the staff to provide individual training to pupils. In addition, when a growth mindset culture is created in the class, this can motivate students to take on more rigorous learning experiences and to persist when encountering difficulties, with potential additional beneficial effects on mental health, as supportive peer climates play an important role in supporting the growth mindset belief (Yeager et al., 2019). Therefore, it may be relevant for instance to conduct a non-inferiority trial, examining whether that delivering this online manualized intervention in a *group format* may be feasible and just as effective in residential care and special education as an intervention offered in an individual format. Third, implementing an online intervention is relatively inexpensive, however, previous research emphasized the crucial role of the extent to which interventions need to be tailored to particular populations and contexts (Dweck & Yeager, 2019; Yeager et al., 2016, 2019; Yeager & Dweck, 2020). Therefore, when scaling up the intervention to different regions or populations adaptation and development of the current intervention to match new target groups and continued research into participant satisfaction and intervention effectiveness are needed.

Finally, it is important to design a framework on how to facilitate and finance the development, improvements, maintenance and implementation for online interventions and in our case The Growth Factory. After the initial development phase of the online intervention, financial recourses are needed to improve the intervention based on lessons learned, and the intervention needs technical maintenance. Furthermore, following the increasing call for more insight into the effectiveness of interventions, and in order to ensure that the most effective and efficient interventions are implemented and disseminated, the Dutch recognition system for youth interventions was developed (Brug et al., 2010; Movisie, 2013). Interventions published in this recognition system go through a process of quality assessment by an independent committee of experts, which determines whether they are effective, and if so, to what extent. The Growth Factory has been accredited in the database Netherlands Youth Institute (Verberg & Helmond, 2019; <https://www.nji.nl/interventies/de-groefabriek>) and is recognized as well described, theoretically sound, and classified with 'initial indications for effectiveness'. These database can be easily assessed online by professionals, and when interventions are officially marked as 'effective', this may serve as a quality mark that may significantly stimulate the uptake and scale up of the intervention in practice.

Closing Statement

Over the past decades, research on mindsets and the effectivity of mindset interventions in the general population has burgeoned. Previous research demonstrated that mindset interventions generally contribute to youth's psychosocial functioning. The current dissertation contributed to the existing literature on the concept of mindset and its relation with psychosocial functioning in youth with intellectual disabilities, and on the effectiveness of an online mindset intervention developed for this at-risk popu-

lation. Overall, the findings in this dissertation demonstrated that youth with intellectual disabilities are more likely to hold fixed beliefs about the malleability of emotions and behaviors compared to peers without intellectual disabilities, and demonstrated that the mindset of youth with intellectual disabilities is related to their psychosocial functioning. More specifically, a growth mindset of emotion and behavior was associated with stronger feelings of empowerment and self-esteem, and with lower levels of internalizing, externalizing, attention, and total mental health problems. Furthermore, the current dissertation demonstrated that the online mindset intervention The Growth Factory (1) was feasible in a special education setting and residential health care organization and positively evaluated by the majority of participants, and (2) had beneficial effects on mindsets, perseverance, self-esteem, collaboration, and mental health. Therefore, The Growth Factory showed to be a promising new intervention with the potential to contribute to the existing evidence-based treatment of youth with intellectual disabilities. The results suggest that The Growth Factory can be delivered widely across special education schools and care organizations at relatively low costs and in efficient ways. Forthcoming research is warranted to build a stronger evidence base and should focus on building growth mindset cultures and investigating active intervention ingredients to further improve the short and long term effectiveness of the intervention.

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Appendices



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Dutch Summary

Jongeren met een licht verstandelijke beperking en borderline intelligentie (LVB; IQ tussen de 50 en 85 met sociale aanpassingsproblemen) hebben een verhoogd risico op het ontwikkelen van onder andere sociale en psychiatrische problemen in vergelijking met jongeren zonder een LVB. Door de complexe problematiek hebben zij vaak langdurige ondersteuning nodig, maar ook verschillende teleurstellingen en faalervaringen opgedaan in hun hulpverlenings- en onderwijstrajecten. Dergelijke negatieve ervaringen hebben mogelijk een negatieve impact op de ontwikkeling van hun impliciete theorieën, ofwel mindset. Een mindset is de (onbewuste) overtuiging die iemand heeft over de veranderbaarheid van eigenschappen als intelligentie, persoonlijkheid en gedrag. Op een continuüm, en wisselend per domein, worden twee mindsets onderscheiden: een groei mindset en een vaste mindset. Mensen met een groei mindset geloven dat deze eigenschappen ontwikkelbaar zijn, terwijl mensen met een vaste mindset menen dat deze vaststaand en oncontroleerbaar zijn. Hierdoor zullen mensen met een groei mindset gebeurtenissen een andere betekenis toekennen en anders reageren dan mensen met een vaste mindset, met name ten aanzien van tegenslag en uitdagingen die zij tegenkomen in het dagelijks leven. Zo zullen mensen met een groei mindset een tegenslag zien als een kans om te leren en zich inspannen om zich te ontwikkelen, terwijl mensen met een vaste mindset tegenslag interpreteren als bewijs voor hun onvermogen en eerder zullen opgeven. Hoe men denkt over en omgaat met inzet, tegenslag en uitdaging wordt in dit proefschrift geduid met de term *doorzettingsvermogen*.

Onderzoek toont aan dat een groei mindset gerelateerd is aan meer gunstige uitkomsten dan een vaste mindset, onder andere op het gebied van mentale gezondheid, sociaal gedrag en academische prestaties. Zo vertonen jongeren met een groei mindset minder emotionele- en gedragsproblemen, zoals angst, depressie en oppositioneel gedrag en hebben zij meer zelfwaardering en gevoelens van empowerment. Daarnaast blijkt dat een groei mindset aangeleerd kan worden middels zogenaamde 'mindset interventies': korte psychologische interventies bestaande uit één tot acht sessies. Deze mindset interventies kunnen daarbij een positief effect hebben op het psychosociale en schoolse functioneren van jongeren. Een mindset interventie zou mogelijk ook een positieve bijdrage kunnen leveren aan de ontwikkeling van jongeren met een LVB. Op dit moment is er echter nog weinig bekend over de mindset van deze doelgroep en een effectieve mindset interventie op maat ontbreekt.

Het doel van dit proefschrift was om de kennis over het concept van mindset bij jongeren met een LVB te vergroten door onderzoek naar (1) mindset en de relatie tussen mindset en psychosociaal functioneren en (2) de uitvoerbaarheid, tevredenheid en effectiviteit van een nieuwe online mindset interventie. Met het beantwoorden van deze vraagstukken beoogt dit proefschrift bij te dragen aan de evidence-based behandeling van jongeren met een LVB. In dit proefschrift refereren we met de term mindsets naar mindset ten aanzien van intelligentie, mindset ten aanzien van emotie en gedrag en het nauwverwante concept doorzettingsvermogen.

Bevindingen

In **Hoofdstuk 2** is onderzoek gedaan naar (1) mindsets van jongeren met een LVB en verschillen tussen jongeren met en zonder een LVB, en (2) de relatie tussen mindsets en psychosociaal functioneren (empowerment, zelfwaardering en internaliserende-, externaliserende-, en aandachtsproblemen) bij jongeren met een LVB. In dit onderzoek werden 247 jongeren met een LVB geworven binnen een residentiële zorginstelling en zes scholen voor speciaal onderwijs in Nederland. Het merendeel van de jongeren was naast de LVB bekend met comorbide problemen als een lichamelijke beperking en/of psychiatrische problematiek. Daarnaast namen 96 leerlingen zonder een verstandelijke beperking van een reguliere middelbare school deel. De resultaten toonden aan dat jongeren met een LVB vaker een vaste mindset ten aanzien van emotie en gedrag hebben dan hun leeftijdsgenoten zonder verstandelijke beperking. Ook binnen de groep jongeren met een LVB vonden we verschillen in mindsets: jongeren met een licht verstandelijke beperking (IQ 50–69) hadden vaker een vaste mindset ten aanzien van intelligentie dan jongeren met borderline intellectueel functioneren (IQ 70–85). Daarnaast rapporteerden jongens meer doorzettingsvermogen dan meisjes. Verder vonden we dat jongeren met psychiatrische problematiek en een lichamelijke beperking vaker een vaste mindset ten aanzien van emotie en gedrag hadden dan jongeren met alleen een lichamelijke beperking. We vonden geen verschillen in mindsets met betrekking tot leeftijd. Tot slot bleken zowel een groeimindset ten aanzien van emotie en gedrag en doorzettingsvermogen gerelateerd aan hogere scores op empowerment en zelfwaardering en aan lagere scores op internaliserende-, externaliserende-, aandachts-, en totale mentale gezondheidsproblemen. Er werden geen relaties gevonden tussen een groeimindset ten aanzien van intelligentie en empowerment, zelfwaardering en mentale gezondheidsproblemen. De bevindingen onderstrepen het belang van een groeimindset voor het psychosociaal functioneren van jongeren met een LVB en suggereren dat het ontwikkelen van een groeimindset ten aanzien van emotie en gedrag een succesvolle manier kan zijn om het psychosociaal functioneren binnen deze risicopopulatie te verbeteren.

Het volgende deel van dit proefschrift is gericht op de ontwikkeling van en onderzoek naar de online mindset interventie De Groeifabriek. De Groeifabriek bouwt voort op wetenschappelijk onderzoek naar impliciete zelftheorieën en mindset interventies van Carol Dweck en David Yeager. De Groeifabriek is ontwikkeld voor jongeren (12 tot 23 jaar) met een verstandelijke beperking en heeft als doel een groeimindset te ontwikkelen en psychosociaal functioneren positief te beïnvloeden. De zes sessies van ieder 30 tot 40 minuten zijn gestructureerd rond de belangrijkste componenten van een groeimindset interventie: (1) uitleg over het brein en plasticiteit van de hersenen, (2) de veronderstelling dat eigenschappen veranderbaar zijn en mensen het vermogen hebben om te veranderen, (3) de formule voor succesvolle verandering: inspanning, juiste strategie en hulp van anderen, en (4) dat verandering niet altijd makkelijk of zeker is, maar wel mogelijk. Naast het gebruik van animaties, interactieve opdrachten, filmfragmenten van succesvolle rolmodellen en “saying-is-believing” oefeningen, bevat De Groeifabriek oefeningen gebaseerd op de principes van cognitieve gedragstherapie (CGT). Hierbij

krijgt met name het herkennen van negatieve gedachten en 'groeigedachten' aandacht en oefenen jongeren met het vervangen van negatieve- voor groeigedachten. Interventies die zijn gebaseerd op CGT laten positieve effecten zien in de behandeling van jongeren met een LVB. Aangezien herhaling en oefening voor mensen met een LVB extra van belang zijn om nieuwe dingen eigen te maken, zijn rollenspellen, tweewekelijkse herinneringen en huiswerkopdrachten geïntegreerd.

Hoofdstuk 3 beschrijft de resultaten van een gerandomiseerde pilotstudie naar de uitvoerbaarheid, tevredenheid en effectiviteit van de nieuwe interventie De Groeifabriek. Deelnemers waren 59 jongeren van 12 tot 18 jaar met een LVB en/of psychiatrische problemen uit het speciaal onderwijs. Een ruime meerderheid (87%) van de deelnemers had een LVB. Daarnaast was de meerderheid (71%) bekend met psychiatrische problemen, denk aan ASS, ADHD en ODD. Na randomisatie namen 29 jongeren deel aan de interventie en volgden 30 jongeren in de controlegroep het reguliere schoolprogramma. De Groeifabriek werd door 85% van de jongeren succesvol afgerond en positief beoordeeld met een 7.5 (schaal 0–10). Daarnaast bleek De Groeifabriek effectief in het aanleren van een groeimindset ten aanzien van intelligentie op korte termijn en in het verbeteren van empowerment op korte termijn tot 3 maanden follow-up. Er werden geen effecten gevonden tijdens de 6 maanden follow-up. Ook werden geen verschillen gevonden tussen de jongeren in de interventie- en controlegroep ten aanzien van coping, zelfwaardering en internaliserende- en externaliserende problemen. Deze eerste resultaten tonen dat De Groeifabriek een veelbelovende nieuwe interventie zou kunnen zijn voor jongeren met een LVB en/of psychiatrische problematiek en gaven aanleiding om De Groeifabriek verder te onderzoeken in een gerandomiseerde en gecontroleerde klinische studie.

In **hoofdstuk 4** werd het studieprotocol van de gerandomiseerde en gecontroleerde studie naar de effectiviteit van de online mindset interventie De Groeifabriek gepresenteerd. Hierin werden de achtergrond, hypothesen, design, doelgroep, procedure, interventie De Groeifabriek, uitkomstmaten en analysemethoden beschreven. Jongeren die benaderd werden voor deelname aan deze studie waren bekend met een LVB en eventueel bijkomende psychiatrische problematiek en/of lichamelijke beperkingen. Jongeren met ernstige emotionele problemen, zoals extreme agressie of een acute instabiele mentale toestand werden uitgesloten van deelname. Deelnemers werden geworven binnen een residentiële zorginstelling en zes scholen voor speciaal onderwijs. Jongeren in de interventiegroep namen onder begeleiding van een getrainde onderzoeksassistent gedurende zes opeenvolgende weken individueel deel aan de sessies van De Groeifabriek naast hun reguliere onderwijs- of zorgprogramma. Drie maanden na de laatste sessie volgden zij individueel de boostersessie (herhaling sessie 6). Jongeren in de controlegroep namen enkel deel aan hun reguliere programma. Alle jongeren vulden vragenlijsten in voor aanvang van de eerste sessie van De Groeifabriek, binnen twee weken na de laatste sessie van De Groeifabriek en bij 3 en 6 maanden follow-up. De primaire uitkomstmaten waren mindset ten aanzien van emotie en gedrag, mindset ten aanzien van intelligentie en doorzettingsvermogen. De secundaire uitkomstmaten waren empowerment, mentale gezondheid (subschalen: internaliserend-, externalise-

rend-, aandacht-, en totaal), zelfwaardering en de meer algemene behandelactoren therapeutische alliantie en behandelmotivatie. Daarnaast beoordeelden jongeren in de interventiegroep de individuele sessies met een score van 1 (zeer laag) tot 10 (zeer hoog) en beantwoordden vier open vragen ten behoeve van de kwantitatieve en kwalitatieve tevredenheid.

In **hoofdstuk 5** werden de resultaten beschreven van het eerste onderzoek naar de effectiviteit van een online mindset interventie voor jongeren met een LVB. In totaal namen 119 jongeren in de leeftijd van 12 tot 23 jaar deel. Naast een verstandelijke beperking was de meerderheid van de deelnemers (92%) bekend met een lichamelijke beperking en/of psychiatrische problematiek. Deelnemers werden gerandomiseerd over de experimentele ($n = 60$) of de controlegroep ($n = 59$). Uit de bevindingen bleek dat De Groeifabriek door de meerderheid van de deelnemers positief werd beoordeeld op zowel kwantitatieve als kwalitatieve tevredenheidsmetingen. Daarnaast had De Groeifabriek effect op het vergroten van doorzettingsvermogen en zelfwaardering en op het verminderen van mentale gezondheidsproblemen (i.e., internaliserend, aandacht, totaal) direct na de interventie. Ook vonden we effect op de samenwerking met de mentor (subschaal therapeutische alliantie): de controlegroep liet een afname zien ten aanzien van de samenwerking op de post-test, terwijl dit bij de interventiegroep gelijk bleef. De effecten op mentale gezondheid hielden aan tot drie maanden na de laatste sessie, maar waren zes maanden na de laatste sessie niet meer zichtbaar. Het verdwijnen van het effect is toe te schrijven aan verbeteringen in de mentale gezondheid in de controlegroep. Daarnaast had De Groeifabriek effect op mindset ten aanzien van intelligentie na drie en zes maanden follow-up en op mindset ten aanzien van emotie en gedrag zes maanden na de interventie. Tot slot had deelname aan De Groeifabriek geen significant effect op empowerment, externaliserende problemen, behandelmotivatie en therapeutische alliantie. Concluderend toont deze studie dat het haalbaar is om een online mindset interventie uit te voeren bij jongeren met een LVB, dat deelnemers positief zijn over De Groeifabriek en dat De Groeifabriek als aanvulling op bestaande zorg- en schoolprogramma's een veelbelovende interventie is ten behoeve van de verbetering van groeimindsets, doorzettingsvermogen, mentale gezondheid, zelfwaardering en therapeutische alliantie bij deze doelgroep.

In **hoofdstuk 6** werden de resultaten van Hoofdstuk 5 nader uitgewerkt om inzichtelijk te maken voor wie en hoe De Groeifabriek werkt. Het doel was om te kijken of de effecten van De Groeifabriek op mentale gezondheid verschillen voor baseline mindsets, leeftijd, geslacht, ernst van verstandelijke beperking en tevredenheid over de interventie. Daarnaast werd doorzettingsvermogen onderzocht als werkzaam mechanisme van De Groeifabriek: we bekeken of de effecten van De Groeifabriek op mentale gezondheid drie maanden na de interventie verklaard zouden kunnen worden door de toename in doorzettingsvermogen direct na de interventie. De resultaten lieten zien dat er verschillen in moderatie-effect waren ten aanzien van tevredenheid en geslacht. De Groeifabriek was effectiever in het verminderen van internaliserende-, externaliserende- en totale mentale gezondheidsproblemen direct na de interventie bij jongeren die meer tevreden waren over De Groeifabriek. Daarnaast bleek De Groeifabriek effectiever

in het verminderen van internaliserende problematiek bij meisjes en in het versterken van doorzettingsvermogen bij jongens. Tot slot was er een indirect effect van De Groeifabriek op mentale gezondheid: een toename van doorzettingsvermogen direct na de interventie was gerelateerd aan een afname van internaliserende en externaliserende problemen op de follow-up meting na drie maanden. Samenvattend geven deze bevindingen aan dat De Groeifabriek effectief lijkt te zijn voor een grote verscheidenheid aan jongeren met een LVB en dat een toename van doorzettingsvermogen bijdraagt aan de afname van mentale gezondheidsproblemen. Doorzettingsvermogen lijkt daarmee een belangrijk werkzaam mechanisme te zijn van De Groeifabriek.

Conclusie

De bevindingen in dit proefschrift hebben bijgedragen aan de kennis over het concept van mindset bij jongeren met een LVB. Uit ons onderzoek blijkt dat jongeren met een LVB vaker een vaste mindset hebben ten aanzien van emotie en gedrag, terwijl een meer groeigerichte mindset van emotie en gedrag bij jongeren met een LVB samenhangt met minder mentale gezondheidsproblemen en meer gevoelens van empowerment en zelfwaardering. Om een groeimindset bij jongeren met een LVB te stimuleren hebben we De Groeifabriek ontwikkeld. Uit ons onderzoek blijkt dat de online mindset interventie De Groeifabriek (1) uitvoerbaar is binnen het speciaal onderwijs en de residentiële zorg en positief beoordeeld is door de meerderheid van de deelnemers en (2) gunstige effecten heeft op mindsets, doorzettingsvermogen, mentale gezondheid, zelfwaardering en therapeutische alliantie. We kunnen concluderen dat De Groeifabriek een veelbelovende nieuwe interventie is voor jongeren met een LVB en comorbide problematiek en een aanvulling op het beperkte aanbod aan evidence-based behandelingen voor deze doelgroep. De Groeifabriek kan breed ingezet worden op scholen voor speciaal onderwijs en binnen de residentiële zorg, tegen relatief lage kosten en op een efficiënte manier vanwege het online format.

Onze bevindingen bieden ook suggesties voor de klinische praktijk en vervolgonderzoek. Om de effecten van de interventie verder te versterken bevelen wij aan De Groeifabriek door te ontwikkelen. Hierbij kan worden gedacht aan het ontwikkelen van een 'groeimindset-cultuur' waarbij de omgeving van de jongeren (ouders, leerkrachten, begeleiders) aan de mindset interventie deelnemen. Zo zal de omgeving een belangrijke rol mogen krijgen in het belichamen, overdragen en borgen van een groeimindset en kan het nuttig zijn om in De Groeifabriek nog explicieter in te gaan op de overtuigingen die iemand heeft over de mate waarin emoties en gedrag veranderbaar zijn door inspanning, het proberen van nieuwe strategieën en hulp van anderen. Gezien het feit dat jongeren met een LVB baat hebben bij herhaling en oefening, kan het tevens zinvol zijn extra tussentijdse oefenmomenten en verlengde boostersessies toe te voegen om de korte- en lange termijn effecten van de interventie te optimaliseren. Daarnaast zouden rolmodellen met meer specifieke verhalen toegevoegd kunnen worden en zouden assistenten een sleutelrol kunnen krijgen bij het vroegtijdig signaleren van en anticiperen op onvrede of motivatieproblemen om uitval te voorkomen. Tot slot zou de Session

Rating Scale ingezet kunnen worden als klinisch hulpmiddel ter verbetering van de therapeutische alliantie tussen jongere en trainer. Om onze conclusies te staven en verstevigen zou toekomstig onderzoek zich kunnen richten op gerandomiseerde gecontroleerde studies met voldoende statische power, inclusie van een actieve controlegroep, psychometrische verbetering van de mindset vragenlijst om diens betrouwbaarheid en validiteit te versterken, en verder onderzoek naar de actieve ingrediënten en modere-rende en mediërende factoren van De Groeifabriek. Tot slot zullen de beschikbaarheid van voldoende digitale hulpmiddelen, training en certificering van trainers/ professionals, en het onderzoeken van de mogelijkheid tot een online klassikaal format van de interventie bijdragen aan een efficiënte en succesvolle implementatie van De Groeifabriek.

Curriculum Vitae

Fenneke Verberg was born on the 31st of March 1983 in Nijmegen, the Netherlands. After completing her secondary education at the Nijmeegse Scholengemeenschap Groenewoud in Nijmegen in 2001, she travelled through Australia, New-Zealand and Thailand for 8 months. Back in the Netherlands, she studied Pedagogical and Educational Science at Radboud University Nijmegen (2002-2008). For a clinical internship during her Master Learning and Development, she worked at Sensis (now called Koninklijke Visio), a centre of expertise for partially sighted and blind people, and spent 5 months in Suriname (2006). Following her clinical Master's degree, Fenneke worked for several months at a special education school for disabled and visually impaired children in Esquel, Argentina. In 2008, she started working for a healthcare employment agency as a social group worker at different healthcare organizations to extend her knowledge and expertise to different populations. In 2009, she started working as a social group worker at the residential health care institute Werkenrode (Pluryn) and worked with youth with intellectual disabilities and comorbid physical and psychiatric problems. During 6 years, she combined this work with working as a scientist practitioner at Koninklijke Visio and GGZ Oost-Brabant, and was involved in several research projects at the Radboud University and GGZ Oost-Brabant. In 2014, she started an external PhD at the Pluryn department Research and Development in collaboration with the University of Amsterdam. Her project concerned the mindset and intervention effectiveness of the newly developed online mindset intervention The Growth Factory for youth with intellectual disabilities in special education and residential health care. The results are described in this thesis and were also presented at several national and international conferences. From April 2019, next to her research, she started working as a behavioral science practitioner at residential health care institute Jan Pieter Heije, Pluryn.

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