Master's thesis

The Relationship of Autistic Traits and Meaning in Life

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Abstract

The relationship between meaning in life (MiL) and autistic traits is currently unknown. However, MiL was identified as an important factor by the autistic community. This study investigates how MiL and autistic traits might be related, exploring potential mediating effects of depression, loneliness, social connectedness, goal clarity/self-concordance, rationality, and intuition. Two cross-sectional datasets utilizing student samples ($N = 150$, $N = 88$) were analysed. Autistic traits and MiL were negatively related through mediators both in the first (depression, loneliness, goal clarity/self-concordance) and second study (depression, social connectedness, and rationality). While there was no direct effect between autistic traits and MiL in the first sample, they were directly positively related in the second sample. Overall, depression, loneliness, social connectedness, goal-setting, and rationality seem to play an important role in the relationship. However, confidence in conclusions is limited due to the nature of the data (non-clinical, homogeneous student samples), restricting interpretability.

Keywords: Autism Spectrum Disorder, Meaning in Life, Mediation

The Relationship of Autistic Traits and Meaning in Life

Introduction

Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder (ASD) is defined in the *DSM-5* as a group of developmental disorders characterized by (1) significant difficulties in social interaction and communication as well as (2) increased rigidity, stereotypic behaviour, and sensory sensitivity to varying degrees (American Psychological Association, 2013). The observable differences between autistic[1] people and neurotypical[2] individuals can be explained through several models of abnormal cognitive information processing (Levy, 2007). In 45-95% of autistic people, over- or under-sensitivities to sensory stimuli can be observed (Ben-Sasson et al., 2009), demonstrating that external stimuli are being processed in different ways by those with ASD. Furthermore, it was found that there was less synaptic pruning and decreased connectivity between the brain regions compared to typically developing adults (O'Hearn et al., 2008).

These neurological differences might explain how autistic people process information differently than those without autism, and why they face a variety of challenges. For instance, they often experience difficulties in education (Jordan, 2005), employment (Chen et al., 2015), language development (Walenski et al., 2006), and sleep disturbances (Manelis-Baram et al., 2022). Co-occurring (psycho-)pathology, such as ADHD, depression, anxiety, or OCD, is common as well (Antshel & Russo, 2019; Khachadourian et al., 2023).

Meaning in Life

While there have been findings that people with ASD experience lower quality of life (QoL) (Ayres et al., 2018) and life satisfaction (Feldhaus et al., 2015), little is known to date

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[1] This paper will use the terms "ASD" and "autism" interchangeably, also including neurodivergent people with the according traits. Despite awareness of terminological differences (e.g., Kenny et al., 2016) these terms will be used for simplification and are not intended to offend stakeholders in any way.

[2] In this context, "neurotypical" means "normal" neurocognitive functioning within social standards, therefore describing the opposite of "neurodivergent" (Walker, 2021).

about how autistic people experience MiL. Here, MiL is conceptually different from QoL as QoL describes basic needs and the absence of disease through the four domains physical health, psychological health, social relationships, and environment (The WHOQOL Group, 1998), while MiL encompasses a deeper, higher-order state of contentment. Life satisfaction is different in that it describes a hedonic, momentary state of happiness, contrary to MiL, which focuses on a eudaimonic, more constant state of contentment and the perception of life being inherently meaningful (Sameer et al., 2023). As QoL and life satisfaction are concepts negatively related to ASD and positively correlated with MiL (Chamberlain & Zika, 1992; Ventegodt et al., 2003) it could be expected that MiL is lower in people with higher autistic traits as well, as first research also points towards (Greaves-Lord et al., 2023).

A more concrete definition of the rather subjective concept of MiL can be challenging (George & Park, 2013; Steger et al., 2006), but a tripartite approach to conceptualizing MiL is most widely accepted (George & Park, 2017). Herein, MiL is said to consist of (1) *coherence*, or *comprehension*, the cognitive part of meaning-making, i.e., perceiving life as coherent, and understanding it; (2) *purpose*, the motivational notion of having clear life goals to work towards, and (3) *mattering*, the affective component of perceiving life to be impactful *beyond the self*, relative to the vastness of the universe (Costin & Vignoles, 2020). Alternative to *mattering*, others find *significance* a more relevant affective aspect, i.e., perceiving one's life as valuable and worth living, describing a more *individual* perspective (Martela & Steger, 2016). It is unclear whether *mattering* and *significance* are two distinct constructs or components of one overarching affective aspect of MiL (Martela & Steger, 2023). Additionally, some also add general subjective *MiL judgment* as a relevant fourth component (Costin & Vignoles, 2020).

Clinical Relevance

Striving for increased MiL is desirable as the concept is associated with positive outcomes, such as higher well-being (Bano, 2014) and lower levels of psychopathology

(Marco et al., 2020). Increasing MiL through interventions is a recent but seemingly fruitful approach, as some first results suggest it decreases eating disorder symptoms (van Doornik et al., 2024) and negative affect (Luz et al., 2017). However, no research has been done to date on MiL in people with autistic traits, while it seems to be an important topic for them and their stakeholders in the Netherlands (Greaves-Lord et al., 2023; van den Bosch & Greaves-Lord, 2019). Insights into the mechanisms of how MiL and autistic traits might relate are essential to identify potential deficits, and thus needs, in the autistic population, and are the first step towards increasing meaning by developing accordingly targeted interventions.

Potential Mediators in the Relationship between Autistic Traits and MiL

When attempting to increase MiL in people with autism, one cannot simply target the autism itself, as it is a neurodevelopmental, genetically predisposed, and untreatable mental condition. Additionally, many autistic people would not want to get treated for autism itself, as it is an essential part of their identity. A more realistic and respectful approach is to investigate potential mediating factors in the relationship between autism and MiL and to attempt to target these factors.

Depression. Possibly lower MiL in those high in autistic traits might be driven by autistic traits being related to higher psychiatric comorbidity, such as depression. People with ASD are four times more likely to suffer from depression at least once in their life, compared to the general population (Hudson et al., 2019). Depression, encompassing for instance hopelessness, is negatively related to MiL (Baquero-Tomás et al., 2023; Kleftaras & Psarra, 2012), and might thus mediate the relationship between autistic traits and MiL.

(Lack of) Social Connection. Additionally, people higher in ASD traits might experience less MiL through deficits in social connection. Having impaired social skills is an inherent symptom of ASD. It can be explained through an underdeveloped Theory of Mind (Baron-Cohen, 1988), i.e., difficulties intuitively relating to others' perspectives and predicting social situations. This can lead to autistic people feeling lonely and less connected

to others (Grace et al., 2022; Stice & Lavner, 2019). However, a fulfilling social life can contribute to higher MiL (Kleftaras & Psarra, 2012). A social component might thus mediate how autistic traits relate to MiL.

Goal Clarity/Self-Concordance. People with ASD often experience difficulties with executive functioning, such as difficulties with planning, organizing, working memory, and response inhibition (Demetriou et al., 2018; O'Hearn et al., 2008). Finding purpose i.e., a clear direction in life, might thus prove more difficult. While *coherence* and *mattering* are relatively abstract concepts that might be difficult to address clinically, creating *purpose* might be a more realistic and potentially motivating starting point. Executive difficulties could be bypassed by aiding with formulating clear and concrete short-term goals to work towards long-term goals. Additionally, clear goals might help with activation and motivation, thereby counteracting autistic inertia (Buckle et al., 2021; Greaves-Lord et al., 2023). It would therefore be interesting to investigate whether goal clarity might mediate the relationship between autistic traits and reduced MiL.

Having clear goals, however, might not suffice, as it is also essential that life goals are intrinsically motivated to increase fulfilment (Emmons, 2003). Intrinsic goals (e.g., engaging in activism due to one's strong agreement with values and a deep enjoyment of the activities) are more motivating when working towards them and bear larger benefits for well-being when achieved (Sheldon & Elliot, 1999) compared to extrinsic goals (e.g., studying because one's parents expect one to get the degree), which can only provide short-term satisfaction (Sameer et al., 2023). Those high in autistic traits, however, might struggle with formulating intrinsic goals for two reasons.

First, from a biological standpoint, people with autism show differences in sensory processing and tend to be less sensitive to their bodily signals (DuBois et al., 2016). Consequently, they experience more difficulties detecting and giving meaning to internal sensations, i.e. understanding their emotions, and often experience alexithymia, so-called

'emotion blindness' (Kinnaird et al., 2019). This, however, hinders a connection with the self and one's intrinsic needs, thereby impairing the ability to formulate intrinsic, meaningful goals.

Second, from a social perspective, people with ASD are inherently impaired in their social skills, and therefore experience more social rejection and loneliness (Grace et al., 2022), and learn throughout their lives that they do not fit well into society. They often engage in camouflaging, i.e., adjusting to the expectations and social identities of others, instead of their own intrinsic needs (Cook et al., 2021). This distancing from the self hinders the development of self-knowledge and self-acceptance (de Graaff et al., 2023; Greaves-Lord, Kruizinga, et al., 2022). However, a clear sense of one's own identity, through self-knowledge and self-acceptance, is essential for developing intrinsic, fulfilling, and thus meaningful goals, as one cannot have truly intrinsic goals if one's identity, values, and needs are unclear. Consequently, self-concordance, i.e., the extent to which one's life goals are intrinsically motivated, might mediate the relationship between autistic traits and MiL.

Rationality and Intuition. The challenges of autistic people to connect with their self can also be observed through their relatively low propensity to engage in intuitive decision-making compared to the neurotypical population (Levin et al., 2015; Taylor et al., 2022). This might reflect a collective learning experience of not wanting to rely on one's intuition. Self-trust might have led to social rejection and chaotic decision-making in the past, due to reduced access to executive function, especially in occasions of high tension (Greaves-Lord, Skuse, et al., 2022). However, being connected with one's intuition is negatively related to psychopathology and correlates positively with MiL (Heintzelman & King, 2016; Remmers et al., 2023), as one can recognize (interoception), interpret (no alexithymia), and trust one's bodily sensations.

Rather than trusting their intuition, some studies found that people with ASD tend to rely more on rationality (Brosnan et al., 2016, 2017). However, other studies found no

differences (Morsanyi & Hamilton, 2023; Taylor et al., 2022), making it unclear whether this difference exists. Enhanced rationality, if present, can be a useful characteristic, or coping style, in moments of crisis (Gosling & Moutier, 2018), although it might come at the cost of trusting one's intuition less. Therefore, it might be interesting to explore how the propensity to engage in rational and intuitive decision-making might mediate the relationship between autistic traits and MiL.

Research Questions, Models, and Hypotheses

This study will investigate two research questions utilizing two studies. Firstly (**RQ1**), it will be explored in both studies how autistic traits relate to MiL. It is hypothesized that autistic traits correlate negatively with overall MiL (**H1**), as well as individual subscales and different conceptualizations of MiL. In the first study, this will be done with a scale by Costin and Vignoles (2020), including *coherence*, *purpose*, *mattering*, and *MiL judgment* (**H2**), and in the second study with a scale by Martela and Steger (2023) including *coherence*, *purpose*, and *significance* (**H3**). Secondly (**RQ2**), it will be investigated whether the relationship between autistic traits and MiL can be explained through several mediating mechanisms. The first study will examine the mediators depression (**H1**), loneliness (**H2**), goal clarity (**H3a**), and self-concordance (**H3b**). It is hypothesized that all four mediate the effect, whereby depression and loneliness are expected to relate positively to autistic traits and negatively to MiL, and goal clarity and self-concordance are hypothesized to relate negatively to autistic traits and positively to MiL. The second study will attempt to replicate the mediating effect of depression (**H1**) and (lack of) social connectedness (**H2**) in the relationship between autistic traits and MiL, as well as investigate possible mediating effects of rationality (**H4a**) and intuition (**H4b**). Again, it is hypothesized that autism is positively related to depressive symptoms, while depression correlates negatively with MiL, and the same relationship directions are hypothesized for rationality. As the positive opposite of loneliness is used in this study, i.e., perceived social connectedness, it is hypothesized that connectedness is negatively

related to autism and positively to MiL, with the same relationship directions being

hypothesized for intuition. A conceptualization of the models that will be examined in each

study and the hypothesized relationships between variables can be found in Figure 1.

Additionally, an overview of research questions and hypotheses can be found in Table 1.
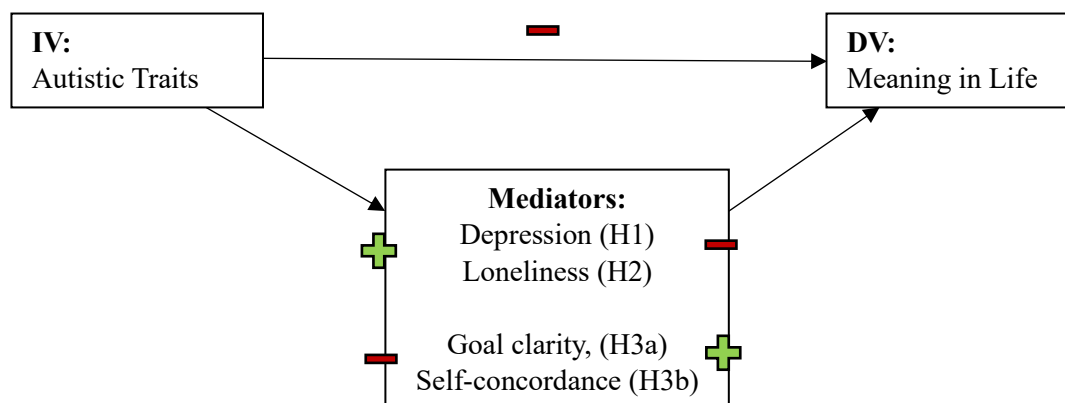
Figure 1.

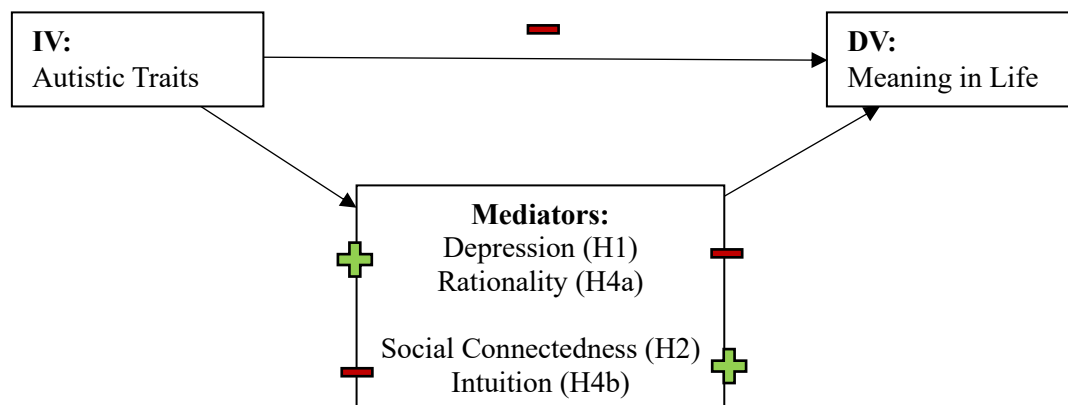*Models of Research Questions and Hypotheses*

Research Question 1 (study 1 & 2): Are autistic traits negatively related to MiL?
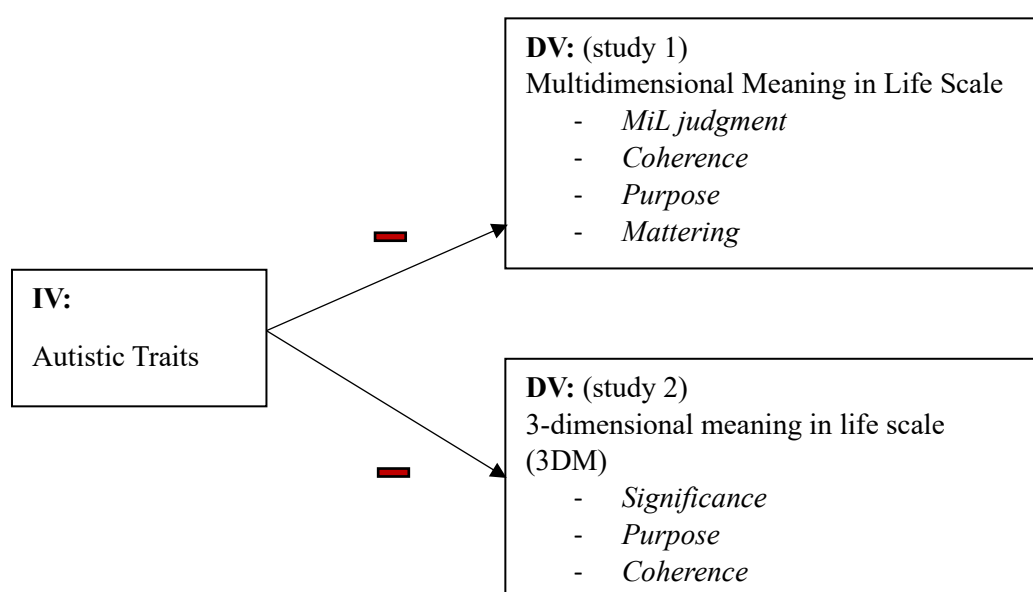
Research Question 2 (study 1): Do depression (H1), loneliness (H2), goal clarity (H3), and

goal self-concordance (H4) mediate the relationship between autistic traits and MiL?

Research Question 2 (study 2): Do depression, social connectedness, rationality, and intuition

mediate the relationship between autistic traits and MiL?

Table 1

Overview of Research Questions and Hypotheses

		Investigated by	
		Study 1	Study 2
RQ 1	Are autistic traits and MiL related?		
H1	Autistic traits and MiL are negatively correlated	x	x
H2	Autistic traits and MiL are negatively correlated with MiL subscales of the MMiL scale (Costin & Vignoles, 2020)	x	
H3	Autistic traits and MiL are negatively correlated with MiL subscales of the 3DM (Martela & Steger, 2023)		x
RQ 2	Is the relationship between autistic traits and MiL mediated by other factors?		
H1	Autistic traits and MiL are mediated by depressive symptom	x	x
H2	Autistic traits and MiL are mediated by a social component - loneliness and/or social connectedness	x	x
H3a	Autistic traits and MiL are mediated by goal clarity	x	
H3b	Autistic traits and MiL are mediated by goal self-concordance	x	
H4a	Autistic traits and MiL are mediated by rationality		x
H4b	Autistic traits and MiL are mediated by intuition		x

Note. RQ = Research Question, H = Hypothesis

Study 1

Method

Design

The data used was not specifically collected for the purpose of this paper but was part of a bigger, currently unpublished research project about flow and goal pursuit conducted by Dr. Brian Ostafin at the University of Groningen. The entire study was conducted in English with (both Dutch and international) students of the University of Groningen, and questionnaires were presented through Qualtrics (https://www.qualtrics.com) in the same way to all participants without random assignment.

Population and Sample

The target population was young adults. Since this is the first research looking into the matter of MiL and autistic traits, convenience sampling was used for this first exploration of potential relationships, as it takes more extensive ethical considerations to conduct the research in a clinical sample. Hence, the research population for this study consisted of first-year psychology students at the University of Groningen, both from the English and the Dutch track of the programme, who participated via the SONA system to earn mandatory study points. Through this system, students can choose freely which studies to participate in. The study was approved by the ethical committee of the University of Groningen (PSY-2223-S-0425).

Data from 170 participants was collected. Nineteen participants were excluded due to not meeting the inclusion criteria: giving consent for data handling, being proficient in the English language, i.e., answering at least "*moderately fluent*" or higher on the control item "*How fluent are you in the English language?*" (with five answering options ranging from "*not at all fluent*" to "*completely fluent*"), and answering with "*yes*" on the control item "*Please let us know if we should use your data. If you did not take the study seriously – e.g.,*

didn't answer carefully or honestly – then our data analysis will be improved if we leave your data out." The final sample thus consisted of 151 participants.

Variables and Instruments

Autistic Traits. For measuring autistic traits, the self-reported Autism Spectrum Quotient (AQ-10) (Allison et al., 2012) was used, which is a ten-item screening tool used to measure autistic symptoms such as focus on details (e.g., "*I often notice small sounds when others do not*"), rigidity (e.g., "*If there is an interruption, I can switch back to what I was doing very quickly*"), and social cognition (e.g., "*I find it difficult to work out people's intentions*"). In the original questionnaire, all items are answered on a four-point Likert scale ranging from "*strongly agree*" to "*strongly disagree*", whereby half of the items are reversed-scored. In this study, similar to more recent literature (Bertram & Shah, 2021; Huson et al., 2024), *"definitely"* was used instead of *"strongly"*. To calculate the total score of the AQ, scores ranging from one to four were added, leading to a minimum of ten and a maximum of 40 points. The responses were thus not dichotomized (coded 0 and 1, leading to a total score from zero to ten), as is commonly done for diagnostic screening purposes, to maintain nuances and variability of the scale in this research context. The sum score on the questionnaire has internal reliability according to Cronbach's alpha of $\alpha = .85$ (Allison et al., 2012). However, this was found in a mixed sample of non-clinical adults and adults diagnosed with ASD using dichotomized scores. Reliability was computed again for the present sample and the full-scale range.

Meaning in Life. In order to assess MiL, the Meaning in Life Scale by Costin & Vignoles (2020) was used. The scale consists of 16 items and four sub-scales: *coherence*, *purpose*, *mattering*, and *MiL judgment* (also: *sense of MiL*). Per scale, there are two normally- and two reversed-scored items answered on a seven-point Likert scale ranging from 1 = "*strongly disagree*" to 7 = "*strongly agree*". Previous research (Costin & Vignoles, 2020) showed good reliability in the general population, indicated by the composite reliabilities of

the scales ranging from .77 to .92. For this student sample, Cronbach's alpha was calculated

for the total scale.

Depression. To assess participants' depressive symptoms, the Patient Health

Questionnaire two-item scale (PHQ-2) depression screener (Kroenke et al., 2003) was used,

which is a short version of the PHQ-9 (Kroenke et al., 2001). Here, participants were asked

"*Over the last 2 weeks, how often have you been bothered by any of the following problems?*",

namely "*Little interest or pleasure in doing things*" and "*Feeling down, depressed, or*

hopeless". Both items were rated on a four-point Likert scale (0 = "*not at all*", 1 = "*several*

days", 2 = "*more than half days*", 3 = "*nearly every day*"). After scores are summed up,

results can range from zero to six.

Loneliness. Loneliness was assessed using the UCLA 3-item loneliness scale (Hughes

et al., 2004). On a four-point Likert scale ranging from 1 = "*never*" to 4 = "*often*", participants

indicated how often they experience a "*lack of companionship*", or "*feel left out*"/ "*feel*

isolated from others". In the US-American adult population, Cronbach's alpha was found to

be $\alpha = .72$ (Hughes et al., 2004), however, reliability was computed again for the present

student sample.

Goal Clarity/Self-Concordance. Participants were asked to name three life goals that

they currently pursue and rate these on several dimensions. For each goal, they were asked to

evaluate goal clarity ("*How clear an idea do you have of what you need to do to be successful*

with this goal?") on a six-point Likert scale ranging from 1 = "*not at all*" to 6 = "*very much*".

The final score was attained by averaging the scores of all three goals. The item was created

for this study, and reliability was not computed as this variable consists of one item only.

To assess the self-concordance of the life goals, a short questionnaire by Sheldon and

Elliot (1999) was implemented. The four dimensions of self-concordance were evaluated

through four items, assessing whether one pursues the goal because "*somebody else wants me*

to or the situation demands it" (external), "*I would feel ashamed, guilty, or anxious if I didn't*"

(introjected), "*I really believe it is an important goal to have*" (identified), or "*I enjoy it and am interested and engaged in it*" (intrinsic). All items were rated on a six-point Likert scale ranging from 1 = "*not at all for this reason*" to 6 = "*very much for this reason*". Here, the six-point scale was chosen over the originally proposed nine-point scale (Sheldon & Elliot, 1999) for consistency with the previous goal clarity item. Scores were calculated by determining average scores across goals on all individual items, summing identified and intrinsic scores, and subtracting external and introjected scores. Reliability for this scale in psychology students ranges from $\alpha = .72$ to .80 (Sheldon & Elliot, 1999). Reliability was calculated again here with the six-point scale version.

Control Variables. Participants were asked to indicate their gender, with options "*female*", "*male*", and "*other*", coded 0, 1, and 2, respectively. Further, they indicated their age in full years.

Procedure

The study was conducted online and started with information about the purpose of the study. Participants were informed that they could withdraw from the questionnaire at any time without this affecting their study points and that their data would be handled confidentially. After assessing demographic variables, questionnaires on life satisfaction, MiL, flow, life goals, anxiety, depression, loneliness, boredom, alcohol addiction, and autistic traits followed.

Power and Sample Size

Eight variables were included in the analysis, namely autistic traits, MiL, depressive symptoms, loneliness, goal clarity, self-concordance, age, and gender. According to Cohen (2016), an effect size of at least Cohen's $f^2 \geq 0.10$ (small-medium effect) can be detected at power = .80 and a two-sided critical value of $\alpha = .05$ with a sample size of 151.

Statistical Analysis

All analyses were conducted in R Statistical Software (v4.2.1, R Core Team, 2021), and scripts can be requested from the first author. Inter-item reliabilities were calculated using

Cronbach's alpha. Next, a missing data analysis was conducted, whereby indicator variables were created. In the case of at least 5% missing data, a two-sample t-test was used to compare missing versus non-missing cases to test whether data was missing at random. Consequently, descriptive statistics and robust measures were calculated, and distributions of all variables were visually inspected. To investigate **RQ1-H1**, bivariate correlations were calculated between autistic traits and MiL. A multiple regression explored the correlation between the subscales of MiL and autistic traits (**RQ1-H2**). Bivariate correlations between all variables included in this study were calculated to get a first impression of how variables relate to each other regarding **RQ2**. To investigate **RQ2 (H1, H2, H3, H4)**, a mediation analysis was done using Process Macro in R (Hayes, 2013), with autistic traits as the independent variable, MiL as the dependent variable, and the mediators depression, loneliness, goal clarity, and self-concordance. To determine the final model, variables that did not explain a significant and meaningful amount of variance (R^2) were removed while striving for parsimony regarding the number of independent variables. Assumptions were checked for this final model regarding linearity and homoscedasticity (through residuals vs. fitted y-values plot), normality of residuals (via their QQ plot), and influential observations (examining the residuals vs. leverage plot). Lastly, the variance inflation factor (VIF) was calculated to determine multicollinearity, and the influence of potential outliers was investigated.

Results

Reliability

In the current sample, the MMiL scale ($\alpha = .88$) and the UCLA 3-item loneliness scale ($\alpha = .83$) demonstrated good reliability. The self-concordance scale ($\alpha = .63$) showed questionable reliability and the AQ ($\alpha = .30$) showed unacceptably poor reliability.

Data Inspection

During the administration of the AQ, an error occurred where one item was duplicated, and another item was omitted. To address this, the participants' responses to the duplicated

item were averaged into one item score. As the AQ now had nine items (instead of ten), the maximum score was reduced from 40 to 36. Further, technical difficulties led to this questionnaire beginning with "*This questionnaire contains statements related to spirituality*." Additionally, a few participants took a noticeably short or long time to complete the questionnaire (see Appendix A for details). Since these outliers were not significantly different from the other participants, they were included in the analysis.

Missing Data. One participant did not complete the AQ. As this was only the case for one person, this participant was excluded from the analyses, leaving a sample of 150. Additionally, one participant did not report their age, and another did not complete the goal clarity and self-concordance scales. As these participants did not exhibit extraordinary values on other variables, and they had only missing data on mediation and control variables, they were included in analyses not involving the according variables, using an available case analysis approach, which is appropriate in this case (Ross et al., 2020).

Descriptives

Approximately two-thirds of the sample was female (66.89%), and one-third was male (32.45%). One participant (0.66%) identified as "*other*" and was excluded from regression analyses involving gender since a single data point is unsuitable for group comparisons. Over half of the participants were Dutch (58%), 18% were German, and 24% were from other EU and non-EU countries. The means and variances of continuous variables, along with their 10% winsorized means and variances, can be found in Table 2.

Table 2

Descriptive Statistics of Continuous Variables

Variable	*M*	*var*	*Win M*	*Win var*
Autistic Traits	19.33	9.40	19.46	4.08
Meaning in Life	78.48	183.42	79.97	61.32
Depression	3.45	2.58	3.03	0.78
Loneliness	7.02	5.56	7.00	2.48
Goal Clarity	14.27	5.51	14.50	1.59
Goal Self-Concordance	4.35	5.94	4.31	2.79
Age	20.39	3.55	20.25	1.43

Note. M = mean, *SD* = standard deviation, *Win M* = 10 % winsorized mean, *Win var* = 10 % winsorized standard deviation

Figure 2 includes histograms displaying the distributions of the continuous variables (MiL, autistic traits, depressive symptoms, loneliness, goal clarity, goal self-concordance, and age). Participants' ages ranged from 17 to 27 years, with a mean of 20.39 and a standard deviation of 1.88. Although the age distribution was slightly right-skewed ($\gamma = 1.15$), the regular descriptive statistics were similar to the robust (winsorized) ones, without robust outliers. The depression variable was right-skewed due to six outliers scoring the maximum PHQ-2 value, although skewness was still within the acceptable range ($\gamma = 1.19$). For all other continuous variables (i.e., MiL, autistic traits, loneliness, goal clarity, self-concordance), regular and robust measures were similar, no outliers were detected, and they were all approximately normally distributed with skew and kurtosis within the acceptable range.

Bivariate Correlations

Bivariate relationships of continuous variables can be found in Figure 2. In line with what was hypothesized, it could be observed that MiL and autistic traits were significantly negatively related (**RQ1-H1**). Most bivariate relationships showed trends in line with the other hypotheses regarding the mediation effects (**R2-H2, H3a, H3b**). The only exception was the relationship between autistic traits and depressive symptoms (**R2-H1**; $r = .15$, $p =$

.07), which was just below statistical significance and had a small effect size. Nevertheless, there was a trend in the hypothesized positive direction.

Looking at the control variables, age did not seem to be related to MiL, only slightly positively to goal self-concordance. Regarding gender, MiL scores were lower for female participants (M = 76.63, SD = 13.83) than for male participants (M = 81.88, SD = 12.21. The effect was statistically significant according to the two-sample t-test (t = -2.36, p = .02). However, the difference did not seem practically significant since the effect was relatively small (a five-point difference on a 0-100 scale). Additionally, the two distributions were symmetric and overlapped considerably, with the upper bound of the 95% CI of differences [-9.42; -0.61] close to zero. The one participant who identified as "*other*" scored relatively high on the MiL scale (97). See Appendix B for visualizations.

Figure 2

Correlation Matrix of all Continuous Variables
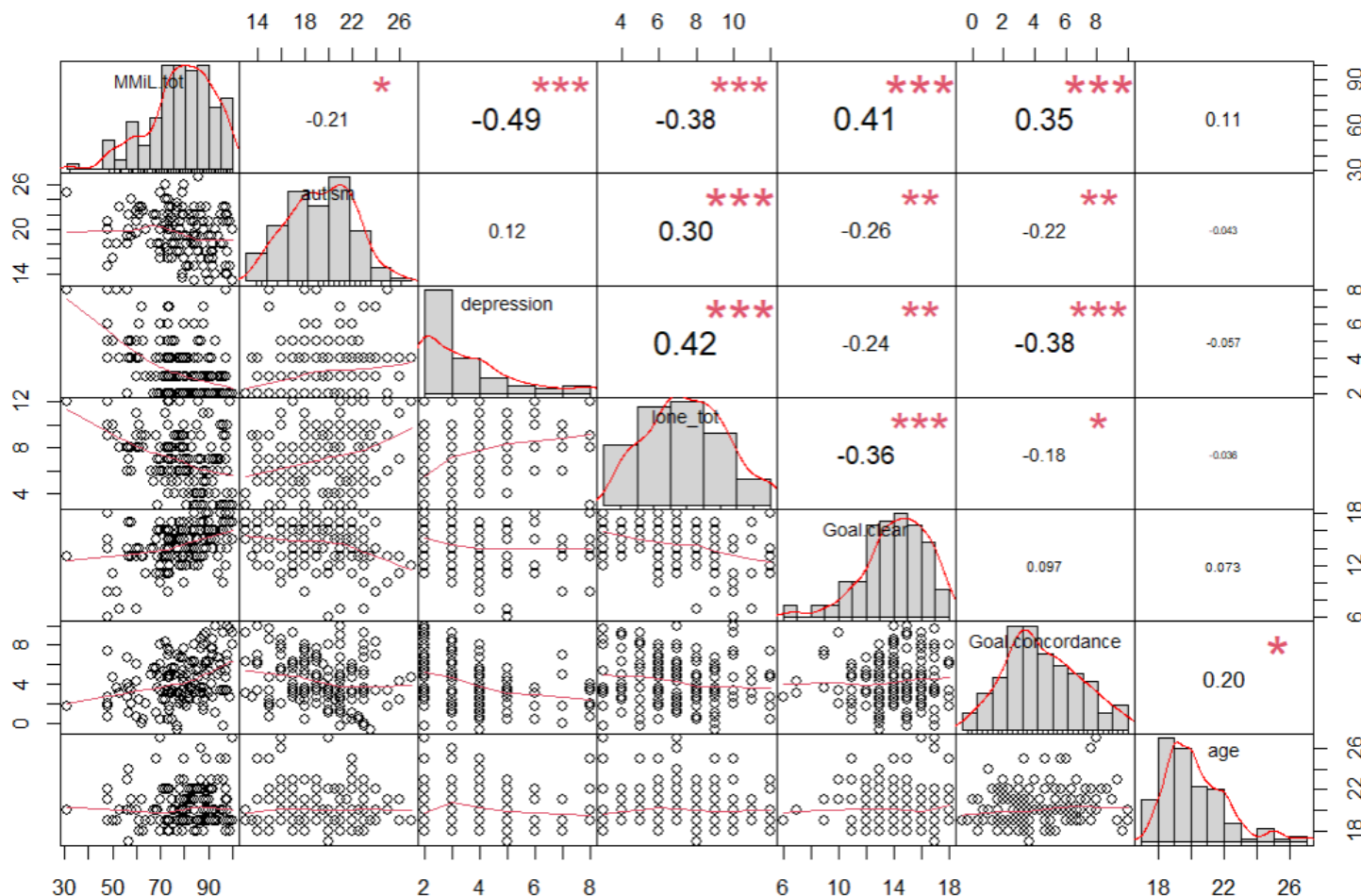
Subscales of MiL

Results regarding (**RQ1–H2**) can be found in Table 3. It is noticeable that only the

coherence subscale showed a small trend of negatively relating to autistic traits, and that

mattering (although non-significant) even showed a slight positive association with autistic

traits.

Table 3

Analysis of Autistic Traits and Subscales of MiL

	Estimate	*SE*	95% CI	*t*	*p*	Adj. R^2
Intercept	24.49	1.57	[21.38; 27.59]	15.58	<.001	.06
Coherence	-.14	0.08	[-.31; .02]	-1.20	.09	
Purpose	-.04	.06	[-.16; .09]	-0.58	.56	
Mattering	.04	0.04	[-.04; .13]	0.97	.33	
MiL judgment	-.09	0.07	[-.24; .06]	-1.20	.23	

Note. SE = Standard error, CI = 95% Confidence interval, *p < .05, ** p < .01, *** p < .001,

two tailed.

Main Regression Analyses

Model Selection Process. The multiple mediation analyses showed that gender and

age were not of significant influence in the model, so it was decided to remove them in a

second model, which only resulted in a reduction of the explained variance of R^2 = .02. In a

third model, it was decided to remove the two non-significant mediators. However, this

resulted in a significant reduction of explained variance (F = 7.32, p < .001), therefore, it was

decided to leave these two mediators in the final model. This model had a large total effect

size (Cohen's f^2 = .59). The details of each model can be found in Appendix C, Table 8. Figure

3 shows a visualization of relationships in the final model.

Figure 3

Visualization of Final Mediation Analysis
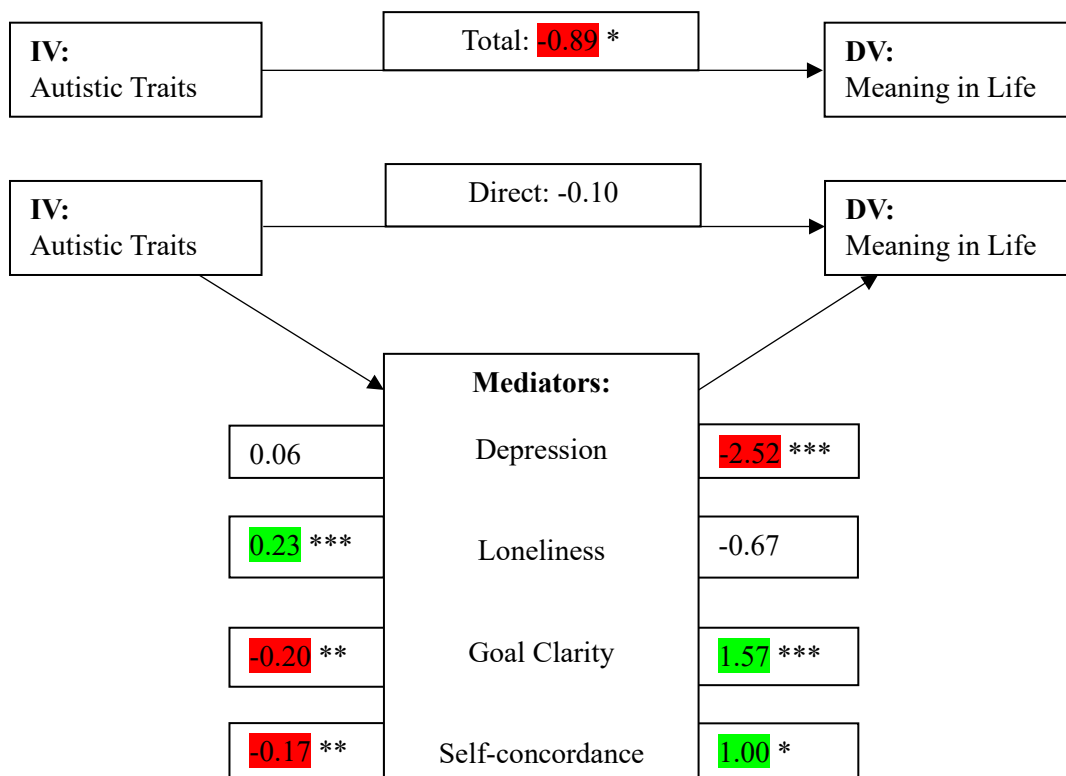
Note. Correlation coefficients of the mediation analysis are given. Positive effects are marked in green, negative effects are marked in red. *$p < .05$, ** $p < .01$, *** $p < .001$, two tailed. Total effect = the effect between the independent and dependent variable, without taking other variables (mediators) into account. Direct effect = the effect between the independent and dependent variable while also accounting for other (mediating) variables. Correlations between the independent variable (autistic traits) and individual mediators are given on the left side of the "mediators" block, correlations between individual mediators and the dependent variable (MiL) are given on the right side of the "mediators" block.

Results of the Final Model. In line with the first hypothesis of the first research question (**RQ1–H1**), this final model showed an overall significant negative relationship between only autistic traits and MiL (total effect). Regarding the second research question (**RQ2**), the correlation between autistic traits and MiL became non-significant when taking

the mediators into account (direct effect), indicating that the relationship can be fully explained by mediating mechanisms. The indirect effects of depression (**RQ2-H1**) and loneliness (**RQ2-H2**) were not statistically significant. While depression related negatively to MiL individually as predicted, it did not correlate significantly with autistic traits, although the hypothesized positive trend was present. Loneliness, on the other hand, related significantly positively with autistic traits as hypothesized but did not relate to MiL. Although the confidence intervals of the indirect effects of these two mediators were non-symmetrical and only barely included zero, the first two hypotheses of the second research question could therefore not be confirmed. However, the indirect effects of goal clarity (**RQ2-H3a**) and goal self-concordance (**RQ2-H3b**) were statistically significant, in line with the third and fourth hypotheses of the second research question. Here, both mediators related negatively to autistic traits and positively to MiL, as predicted. Nevertheless, the effects were overall small.

Assumptions. Assumptions were checked for the final model (see Appendix D for details).

Influential Observations. After removing the outliers, the previously significant effect of autistic traits and MiL turned insignificant (see Appendix C, Table 9). The reason for this can be found in the sample being predominantly high in MiL and being mostly low on autistic traits. Observation 95 was the only participant scoring below 48 on the MMiL scale, scoring 31. At the same time, this participant also scored relatively high on the AQ (23). This combination of low MiL and high autistic traits made them compatible with **RQ1-H1**. However, the other five participants who scored high on the AQ scored average on the MMiL scale in this sample, thereby influencing the model in the opposite direction after the first participant was removed. The low number of participants low in MiL and (/or) high in autistic traits therefore seemed to have heavily influenced the analysis. Additionally, after removing the outliers, the effect of autistic traits on self-concordance moved just above the cut-off of α ≤ .05, making this indirect effect non-significant.

Explorative Analysis

It was explored whether conclusions of the mediation analysis might change when taking the *purpose* subscale out of the total MMiL scale since a high correlation of goal clarity and self-concordance with the concept of *purpose* can naturally be expected due to conceptual similarities. However, removing this subscale did not change the conclusions regarding goal clarity and self-concordance.

Interim Conclusion

It is unclear what can be concluded from these analyses due to some sparse influential observations scoring high on autistic traits heavily influencing the analysis. The data seems theoretically consistent both with the hypothesis, as well as with null effects.

Study 2

Method

Design

In this study, the data was derived from a currently unpublished research project by Dr. Brian Ostafin, intended to investigate how a short mindfulness intervention might influence students on different dimensions. All questionnaires used in the present study were completed by participants before said intervention was implemented, thus they were not influenced by the intervention. The study was administered in English through Qualtrics (https://www.qualtrics.com) and was presented in the same way to each participant with no random assignment.

Population and Sample

The target population was young adults. The research population consisted of students of the Faculty of Economics and Business at the University of Groningen who had to participate in this study as a compulsory part of a research methods course. The students were asked to come to the lab, where they were given a short explanation of the set-up by two

bachelor's level students involved in the project. Participants then went to a private cubicle and answered the questionnaires on a computer. Ninety-two students were presented with the questionnaire, of which four were excluded from the analyses as they did not meet the inclusion criteria described in study 1 (i.e., consent, English proficiency, and truthful responding). The final sample size was 88. The study was ethically approved by the University of Groningen (PSY-2324-S-0372) and the analysis was pre-registered (https://aspredicted.org/XKJ_64Z).

Variables and Instruments

Similar to study 1, the AQ (Allison et al., 2012) was used to assess autistic traits, however without the spiritualty primer and with all items included. Depressive symptoms, gender, and age were measured in the same way as in the first study.

Meaning in Life. In this study, the three-dimensional meaning in life scale (3DM) by Martela and Steger (2023) was implemented. The 3DM consists of three items on *significance* (e.g., "*My life is full of value*"), four items on *purpose* (e.g., "*I pursue one or more big purposes in my life*"), and four items on *coherence* (e.g., "*Most things in my life do make sense*"). The extent to which participants view these statements as true for themselves was rated on a seven-point Likert scale ranging from 1 = "*not at all true*" to "*very true*". In this study, the 3DM was adjusted so that participants were asked to reflect on how they felt the statements to be true over the last week, and items were phrased in the past tense accordingly. This was done to increase comparability with a one-week follow-up assessment administered in the context of a different goal of this study that is not addressed in the present research. The subscales of the original questionnaire have a reliability of α = .78 to .92 (Martela & Steger, 2023) in the general US-American population. Alphas were calculated in this student sample as well.

Social Connectedness. To assess social connectedness, the 'relationships' sub-scale of the positive psychotherapy inventory was used (Rashid, 2005; Rashid & Seligman, 2018). It

assesses whether participants experience good social support and feel their relationships to be of high quality, i.e., to be intimate. The questionnaire consists of five statements, rated on a five-point Likert scale ranging from 1 = "*not at all like me*" to 5 = "*very much like me*". Cronbach's alpha was found to be good (α = .89) in a German sample (Wammerl et al., 2015), and was calculated as part of the analysis for this international sample.

      Rationality and Intuition. The Rational Experiential Inventory (REI-40) by Epstein and colleagues (Pacini & Epstein, 1999) was (partially, see below) implemented to assess rationality and intuition. The REI-40 consists of a rational dimension (REI-R scale), encompassing the subscales rational ability (e.g., "*I am much better at figuring things out logically than most people*") and rational engagement (e.g., "*I enjoy intellectual challenges*"), and an experiential, or intuitional, dimension (REI-E scale), consisting of the subscales experiential ability (e.g., "*I believe in trusting my hunches*") and experiential engagement (e.g., "*I like to rely on my intuitive impressions)*.

      To maintain the participants' attention and restrict the duration of the questionnaire, the REI-40 was shortened by only including the first two regularly-scored and the first two reverse-scored items of each of the four sub-scales, leading to a total of 16 items which were presented in randomized order. Participants were asked to "*Please indicate how true each of the following statements are for you*" on a seven-point Likert scale from 1 = "*False*" to 7 = "*True*". This differs from the original REI-40, which asks participants to "*Using the following scale, please rate the extent that these items refer to you*", on a five-point Likert scale from 1 = "*definitely true of myself*" to 5 = "*definitely not true of myself*". This was done to improve feasibility in Qualtrics by making answer options less wordy and more in line with previous questionnaires. Reliability for this scale in different samples ranged from α = .86 to .91 for the rationality scale and from α = .87 to .90 (Keaton, 2017), however, reliabilities will be calculated again here with the six-point scale version.

Procedure.

The entire study was done digitally in the lab. Participants were informed before the assessment that they could withdraw from participation at any point without facing consequences regarding course credit. The following questionnaires were presented, in order: demographics, REI-40, Presence of Meaning, future goals, internet use, religion, recent stressful events, PHQ-2, DASS depression scale, 3DM, flow, effort in relationships, social connectedness, AQ-10.

Power and Sample Size

Eight variables were used in the model (autistic traits, MiL, depressive symptoms, social connection, rationality, intuition, age, and gender). The current sample size of 88 can detect an effect of Cohen's $f^2 \geq .18$ (~medium) at power = .80 and a double-sided critical value $\alpha = .05$.

Statistical Analysis

The same analyses were conducted as in the first study.

Results

Reliability

The 3-dimensional MiL scale showed excellent reliability ($\alpha = .92$) and the social connectedness scale showed good reliability ($\alpha = .85$), similar to the rationality ($\alpha = .81$) and intuition ($\alpha = .82$) scales. Like in the first study, the AQ had very poor reliability ($\alpha = .30$)

Data Inspection

Missing Data. There was no missing data observed.

Descriptives

The sample consisted of 49 (56%) female and 39 (44%) male participants, none indicated "*other*". While 36% of the sample was Dutch and 8% German, most participants (55%) indicated "*other*" as their nationality, with participants coming e.g., from Indonesia, Italy, Poland, France, and Greece. The age distribution had three outliers aged above 30, however, most participants were around 20 years old. There were no robust outliers for the

other continuous variables (MiL, autistic traits, depressive symptoms, social connectedness, rationality, and intuition). Means, variances, as well as 10% winsorized means and variances of continuous variables can be found in Table 4. Additionally, Figure 4 shows histograms of each continuous variable except for age, as age was too heavily influenced by its outliers to draw sensible conclusions. Details on questionnaire completion duration can be found in Appendix A.

Table 4

Descriptive Statistics of Continuous Variables

Variable	*M*	*var*	*Win M*	*Win var*
Autistic Traits	22.10	10.53	22.10	5.27
Meaning in Life	52.35	183.95	53.48	92.39
Depression	4.24	2.71	4.26	1.34
Social Connectedness	20.62	12.58	21.05	5.33
Rationality	40.80	40.37	41.55	12.50
Intuition	37.15	43.44	37.12	22.15
Age	20.44	8.16	19.98	0.76

Note. M = mean, *SD* = standard deviation, *Win M* = 10 % winsorized mean, *Win var* = 10 % winsorized standard deviation

Bivariate Correlations

Bivariate relationships of continuous variables (again except for age) can be found in Figure 4. It was immediately noticeable that autistic traits and MiL seemed unrelated in this sample, contrary to what was hypothesized (**RQ1-H1**). Some correlations could be observed that were in line with the hypotheses, such as depressive symptoms relating positively to autistic traits and negatively with MiL (**RQ2-H1**), and social connectedness relating positively with MiL (**RQ2-H2**). At the same time, there was also an effect opposite to what was expected, namely rationality relating negatively to autistic traits (**RQ2-H4a**). Unexpected null effects were autistic traits being unrelated to social connectedness (**RQ2-H2**) and

intuition (**RQ2-H4b**), and MiL being unrelated to rationality and intuition (**RQ2-H4a, H4b**). Regarding the control variables, MiL was not significantly different for females and males (also see Appendix B, Figure 8), neither was it related to age ($r = .22$, $p = .67$).

Figure 4

Correlation Matrix of all Continuous Variables
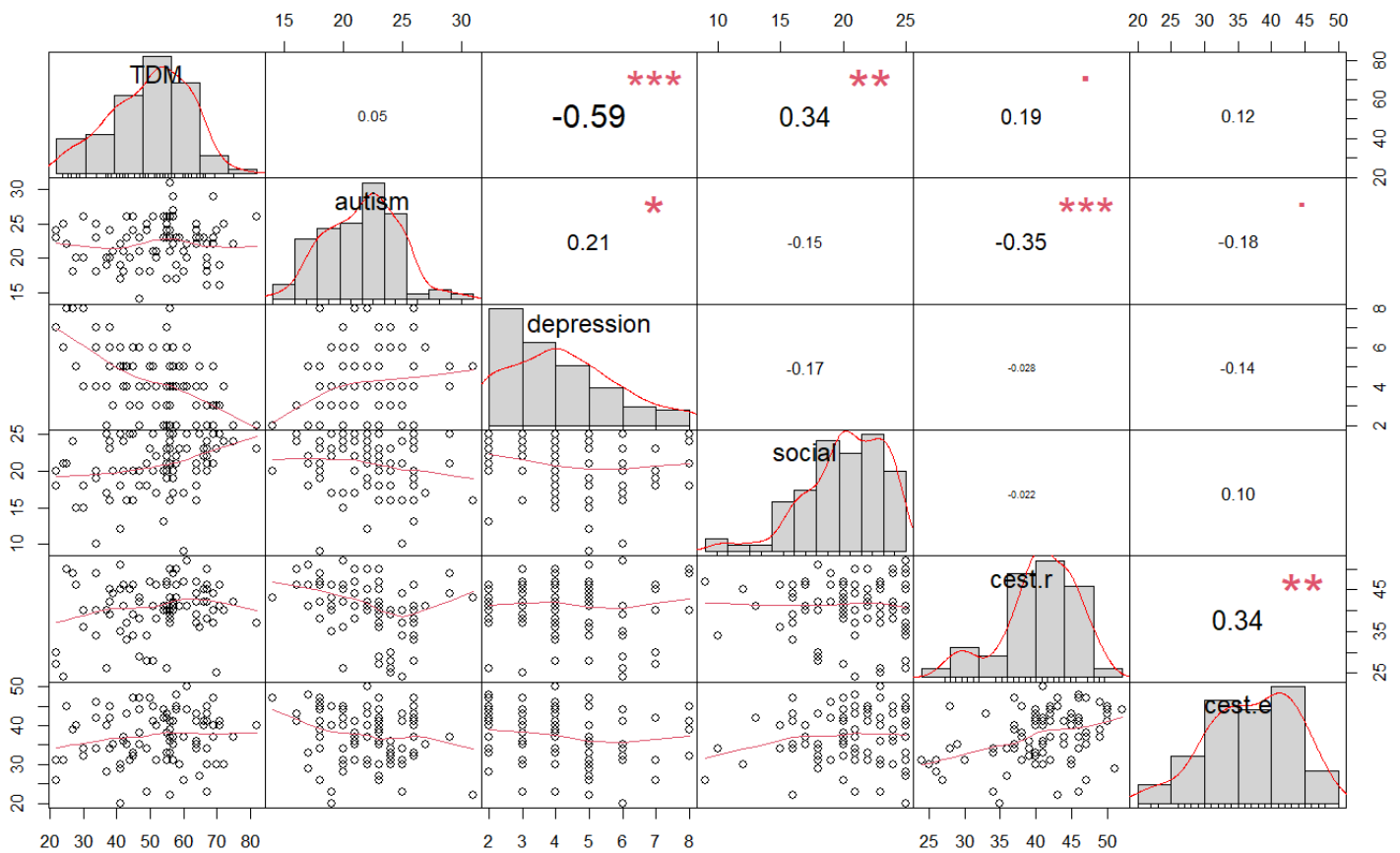
Note. TDM = 3-dimensional MiL scale; *autism_tot* = AQ10 total; *depression* = PHQ-2; *social* = social connectedness scale; *cest.r* = rationality scale of the CEST; *cest.e* = intuition scale of the CEST

Subscales of MiL

Looking at how the subscales of the three-dimensional MiL scale relate to autistic traits (**RQ1-H3**, see Table 5), the *purpose* subscale was significantly positively correlated with autistic traits, opposite to what was hypothesized. The other sub-scales were non-significant and some showed trends in the hypothesized negative direction.
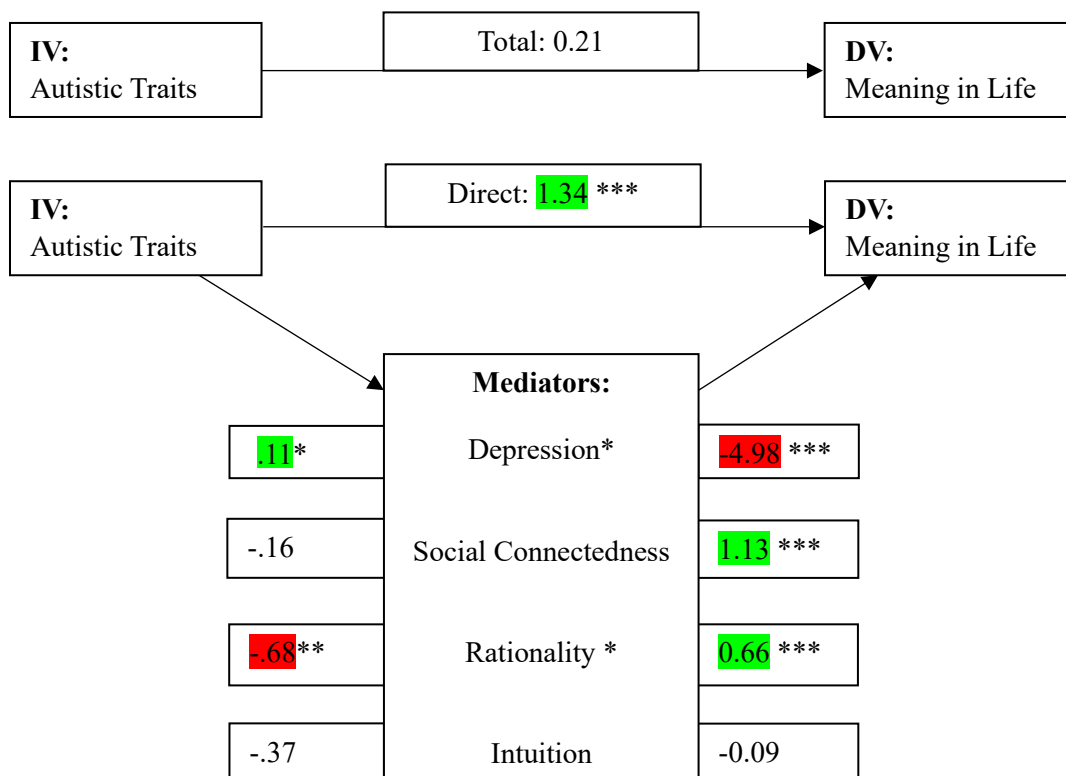
Table 5

Analysis of Autistic Traits and Subscales of MiL

	Estimate	*SE*	95% CI	*t*	*p*	Adj. R^2
Intercept	22.47	1.39	[19.70; 25.24]	16.13	<.001	.06
Coherence	-0.16	0.12	[-0.39; 0.07]	-1.41	.16	
Purpose	0.31	0.11	[0.09; 0.53]	-2.84	.006**	
Significance	-0.20	0.13	[-0.46; 0.06]	-1.52	.13	

Note. SE = Standard error, CI = 95% Confidence interval, *p* < .05, ** *p* < .01, *** *p* < .001, two tailed.

Main Regression Analyses

Model Selection Process. Firstly, due to the non-significant influence of the control variables age and gender, they were removed in the second model, leading to a non-significant reduction in explained variance. In the third model, non-significant mediators were removed, however, this decreased the explained variance significantly (F = 3.33, p = .04), which is why the second model was chosen as the final model. This model showed a large effect size (Cohen's f^2 = 1.13). The results of the mediation analysis can be found in Appendix C, Table 10, while a visualization of the model can be found in Figure 5.

Figure 5

Visualization of Mediation Analysis Results

| IV: Autistic Traits | Total: 0.21 | DV: Meaning in Life |

| IV: Autistic Traits | Direct: 1.34 *** | DV: Meaning in Life |

Mediators:

.11*	Depression*	-4.98 ***
-.16	Social Connectedness	1.13 ***
-.68**	Rationality *	0.66 ***
-.37	Intuition	-0.09

Note. Correlation coefficients of the mediation analysis are given. Positive effects are marked in green, negative effects are marked in red. *$p < .05$, ** $p < .01$, *** $p < .001$, two tailed. Total effect = the "pure" effect between the independent and dependent variable, without taking other variables (mediators) into account. Direct effect = the effect between the independent and dependent variable while accounting for other (mediating) variables. Correlations between the independent variable and individual mediators are given on the left side of the mediator block, correlations between individual mediators and the dependent variable are given on the right side of the mediator block.

Results of the Final Model. Contrary to what was hypothesized (**RQ1-H1**), the total effect of autistic traits on MiL was non-significant. However, the direct effect of autistic traits on MiL was significantly positive when taking the mediators into account. The direction of this direct relationship was thus opposite of what was hypothesized, although it was only

present when including the mediators. This could be explained by an opposing indirect effect of the mediators: In this sample, people high in autistic traits experienced more depressive symptoms, which is in turn associated with less MiL. This was in line with what was hypothesized (**RQ2-H1**). Additionally, there were (small) trends for people high in autistic traits to be less social (in line with **RQ2-H2**), rational (opposite to **RQ2-H4a**), and intuitive (in line with **RQ2-H4b**). These three mediators all tended to be more positively than negatively related to MiL (in line with **RQ2-H2, H4b**, but opposite to **RQ2-H4a**). These mechanisms decreased the total effect that autistic traits had on MiL in this sample.

  Assumptions. Assumption checks were done for the second model (see Appendix D).

  Influential Observations. After removing outliers, social connectedness became more negatively related to autistic traits, as was hypothesized (**RQ2-H2**), making it a significant mediator. At the same time, the mediating effect of depression disappeared (opposing **RQ2-H1**). The conclusion about rationality and intuition (**RQ2-H4a, H4b**) did not change. These model changes after outlier removal were due to the outliers being e.g., low in MiL but high in social connectedness, or the other way around, therefore not fitting well into the proposed model. At the same time, one outlier was low in depression and also low in MiL, thereby weakening the negative relationship between depression and MiL upon removal. Model details after removing outliers can be found in Appendix C, Table 11.

Interim Conclusion

  In this sample, autistic traits and MiL were directly positively associated. The mediators, especially depression, acted as opposing negative indirect effects.

Discussion

  This study investigated the potential relationship between autistic traits and MiL, and possible mediators.

Summary of Findings

Autistic Traits and MiL. The first research question (**RQ1**) aimed to examine, through both studies, whether autistic traits relate negatively to MiL. Here, the results of the first study were in line with the first hypothesis (**RQ1-H1**), as shown by a negative total effect in the mediation analysis. However, this effect could be completely accounted for by the mediators. A closer investigation of the subscales of the MMiL scale (regarding **RQ1-H2**) revealed that autistic traits only showed a small trend of being negatively associated with the *coherence* subscale, but not with other subscales.

Contrary to the first study, autistic traits were not individually related to MiL in the second study. After taking the mediators into account, the relationship turned positive, opposite to what was hypothesized (**RQ1-H1**). When investigating the different subscales of the 3DM, it became clear that autistic traits only correlated significantly positively with the *purpose* subscale.

Depression as a potential mediator. Both studies investigated the possible mediating role of depression in the assumed relationship of autistic traits with MiL (**RQ2-H1**). The first study could not confirm a mediation effect; however, the effect was close to significant. While depressive symptoms were negatively correlated with MiL as hypothesized, depressive symptoms were not significantly positively related to autistic traits, although showing a slightly positive trend.

The data of the second study was in line with the hypothesis (**RQ2-H1**). As expected, autistic traits were positively related to depressive symptoms, and depressive symptoms were in turn negatively related to MiL.

(Lack of) Social Connectedness as a Potential Mediator. Both studies also investigated whether a (lack of) social connectedness could mediate the relationship between autistic traits and MiL (**RQ2-H2**). The first study did so by looking at *loneliness* – similar to depression the effect was non-significant. However, it remains unclear whether this is due to

an underlying null effect or insufficient scale coverage of the MMiL. Nevertheless, loneliness was significantly related to autistic traits. The second study looked into social connectedness. Although non-significant, autistic traits showed a small trend of being negatively correlated with social connectedness, and social connectedness was significantly positively related to MiL, as hypothesized.

Goal Clarity and Self-Concordance as Potential Mediators. Regarding **RQ2-H3a** and **H3b**, the first study looked at goal clarity and goal self-concordance as mediators. It was hypothesized that those with higher autistic traits would struggle more with setting clear and intrinsic goals, which in turn is positively related to meaning-making. These hypotheses could be confirmed, although the results were close to non-significance.

Rationality/Intuition as Potential Mediators. The second study investigated rationality and intuition as potentially impactful mediators (**RQ2-H4a, H4b**). It was hypothesized that participants high in autistic traits would perceive themselves as more rational and less intuitive (Brosnan et al., 2016, 2017). It was also expected that rationality would relate negatively, and intuition positively with MiL. However, none of these hypothesized relationships were confirmed. On the contrary, autistic traits were significantly negatively correlated with self-perceived rationality, and rationality was positively related to MiL (**RQ2-H4a**). Regarding **RQ2-H4b**, perceived intuition was unrelated to autistic traits and MiL. In the bivariate correlations, it was also noticeable that perceived rationality and intuition were positively related.

Interpretations

Autistic Trait and MiL. The negative direct relationship between autistic traits and MiL in the first study could be accounted for by the mediators. This suggests that autistic traits are not directly related to MiL in this sample, but that autistic traits are related to other difficulties (here: depression, loneliness, problems with goal clarity/self-concordance) which are in turn associated with lower MiL. The indirect effects of the second study suggest a

similar trend. It is noticeable that, in both studies, autistic traits and MiL were trend-negatively related through the indirect mediation effects, but not through direct effects.

In the first study, autistic traits were also trend negatively related to the *coherence* subscale. It is unclear whether this correlation is purely coincidental, or whether the central coherence theory of information processing in autism (Frith, 2003; Happé & Frith, 2006) might play an explanatory role in diminished meaning-making. Difficulties with central coherence might make it harder to see life as a coherent whole and to detect patterns, which is however an essential part of MiL (e.g., MacKenzie & Baumeister, 2014). It is necessary for future research to also look into the role of potentially different information processing of those high in autistic traits to understand this relationship better.

Autistic traits were directly positively related to MiL, especially the *purpose* subscale, in the second study. This suggests that those with higher autistic traits in this sample might have a clearer and stronger direction in life in this sample (after accounting for the mediators). This stands in contrast with literature that found those diagnosed with ASD to have problems with executive dysfunction (Demetriou et al., 2018; O'Hearn et al., 2008), which might challenge the pursuit of purpose. However, this study only measured autistic traits and not actual ASD diagnoses. Most of the research on ASD is (naturally) done in the clinical population, with people who are high in autistic traits, whereby their autistic traits negatively influence their daily functioning, due to a mismatch between their autistic traits and their environment, leading to comorbid problems for which they search treatment.

However, this study included students high in autistic traits who were not necessarily also diagnosed with ASD. Participants high in autistic traits without a diagnosis might have found an environment that fits their needs, which is why they might not (yet) experience impairments in relation to these traits. They might even have found an environment where their autistic traits help them thrive, creating a sense of self-efficacy and purpose, thereby increasing MiL. The challenges with executive functioning that those with a clinical diagnosis

tend to experience might not be comparable to those high in autistic traits who do not experience impairment in daily life, i.e. who do not seek out a diagnostic process. People high in autistic traits that are undiagnosed are rarely studied and it is uncertain whether this group also experiences executive dysfunction.

Additionally, those with high in autistic traits in this sample were potentially high-functioning students, as they were pursuing their academic obligations, indicated by their mere participation in the research methods course. To do so, they might already have a lot of self-knowledge and clear goals that they can pursue (purpose), such as potentially their academic pursuits, which might give them more (sense of) meaning. It is therefore important to examine how the relationship would look in a broader sample, with participants from different (also non-academic) backgrounds, and participants who might be unsuccessful in pursuing their goals. More research is needed for further exploration of these associations and for gaining more insight into the possible directions of associations depending on the other relevant characteristics of the participants.

Depression as a Potential Mediator. Depressive symptoms did not mediate the relationship between autistic trait and MiL in the first study, although being close to significance, but were an influential mediator in one model of the second study. Participants' scores were more broadly distributed across both the MiL and autistic traits measures, providing more statistical substance and thereby giving more confidence in results compared to the first study.

The hypotheses were again based on research done with clinically diagnosed autistic patients. This research suggests that autistic traits are positively correlated with depressive symptoms (Hollocks et al., 2019; Hudson et al., 2019) and that depressive symptoms are in turn negatively correlated with MiL (Baquero-Tomás et al., 2023; Kleftaras & Psarra, 2012). However, the present two studies only included (relatively) high-functioning students that are also high in autistic traits and not necessarily diagnosed. This specific group of people might

experience less depression due to higher functioning, or more depression due to higher intelligence (Karpinski et al., 2018; Weismann-Arcache & Tordjman, 2012), which might mask a stronger (or weaker) effect of depression in a clinical sample. Again, future research should investigate how such a relationship would look with participants with a broader range of autistic traits and different levels of impairment, in the hope of covering the full autistic traits scale and thereby gaining more confidence in the conclusions.

(Lack of) Social Connectedness as a Potential Mediator. Loneliness and social connectedness were non-significant mediators; however, they were both close to significance. The first study could confirm earlier findings that loneliness might be something that those high in autistic traits struggle with (Grace et al., 2022). In line with the literature (Beffel et al., 2021; Pollmann et al., 2010), those high in autistic traits also tended to experience slightly lower social connectedness in the second study (although non-significant). Additionally, social connectedness was positively correlated with MiL, confirming previous literature on the topic (Kleftaras & Psarra, 2012). The results point towards social connectedness being potentially important in a meaning-making process, also for those with autistic traits. However, more research is needed to explore the nature of this relationship. In practice, targeting social relations could decrease feelings of loneliness, thereby increasing MiL and potentially decreasing depression (Erzen & Çikrikci, 2018; Taylor et al., 2020).

Goal Clarity and Self-Concordance as Potential Mediators. Results from the first study show that goal setting, i.e., having clear, intrinsic goals, might play an important role in meaning-making. More thorough research is needed to investigate whether difficulties in goal-setting might have their origins in problems with executive dysfunction (Demetriou et al., 2018; O'Hearn et al., 2008) and self-knowledge (de Graaff et al., 2023; Greaves-Lord et al., 2022), as argued earlier. Additionally, the kind of life goals participants had was not qualitatively investigated. Potentially, whether one has large, relatively unrealistic goals (e.g., winning the Olympic games) or small, easily achievable goals (e.g., cleaning one's room

within the next three days) might make a difference in how much they increase MiL. It would be interesting to investigate what kind of goals (e.g., long- vs. short-term, relating to others vs. only the self) might be well-suited for meaning-making.

  Rationality/Intuition as Potential Mediators. The hypotheses that those high in autistic traits would be more rational and less intuitive was mostly based on studies assessing rational and intuitive tendencies through performance tests (Brosnan et al., 2016, 2017). However, the present study investigated participants' *perceived* preference for and ability to think rationally. Those high in autistic traits in this sample thus tend to *perceive* themselves as not very rational. It is unknown whether these participants are actually not rational in their decision-making, or whether they might be even more rational by being more aware of their human biases and admitting to not being able to be truly rational. Objective performance testing is needed for the proper judgement of rational versus intuitive propensity.

  At the same time, rationality was positively related to MiL, suggesting that focusing on rationality might aid in the process of meaning-making, an approach already investigated for instance in the combination of Rational Emotive Behaviour Therapy and logotherapy (Russo-Netzer & Ameli, 2021).

  From this study, no conclusions can be made about how intuition relates to autistic traits and MiL. This sample was possibly more connected to their intuition than a clinical sample would be. Again, future research should investigate how this self-perception relates to objective performance testing.

  Through bivariate correlations, this study also showed that perceived rationality and intuition were positively related. It might make sense, in future research, to investigate how a balance between rationality and intuition might relate to meaning-making. High rationality and high intuition might relate to the connection and integration of mind (rationality) and body (intuition), thereby creating meaning through realistic approaches that resonate with

one's identity. It would therefore be interesting to investigate in future research how the two relate to each other instead of seeing them as opposites.

Methodological Considerations

    Statistical Conclusion Validity. The first study could not capture the whole range of the AQ-10 due to the one item omitted. Additionally, most participants scored predominantly low on the autistic traits scale. Further, most participants scored rather high on the MiL, making conclusions about those low in MiL difficult. This led to only partial overlap of distributions and thereby possibly biased effects, as it is unknown how other participants low in MiL or high in autistic traits would influence the analysis. One participant low in MiL and high on autistic traits heavily influenced the model, therefore it is necessary to replicate the results with a sample including more participants low in MiL and high in autistic traits to investigate whether this correlation persists. The distributions of MiL and autistic traits were more spread out in the second study, and a larger effect was detected ($R^2 = .37$ vs. $R^2 = .53$), giving more confidence in results compared to the first study.

    Internal Validity. The design of this research was cross-sectional; therefore, no causal conclusions can be made. However, it is impossible to implement a causal design for these research questions, as autistic traits cannot be induced due to their developmental origin. Alternatively, longitudinal research might allow more insights into developmental processes and more confidence in conclusions. This research was exploratory, on a topic newly emerging in the autism field, which is why, out of practicality, data was used from studies originally designed for other purposes. If a study would be set up specifically to investigate the research questions above, it would be crucial to include a question on whether participants are diagnosed with autistic traits, or to conduct a diagnostic process for each participant, e.g. with a DSM-5 interview (Spek, 2018) or ADOS (Lord et al., 2000, 2012). It would also be crucial to ensure that the sample is more heterogeneous concerning socio-economic background, age, and all relevant variables. Additionally, it would be important to include

measures on the mechanisms hypothesized at work which were suggested in the introduction, such as executive functioning (Demetriou et al., 2018; O'Hearn et al., 2008), central coherence (Happé & Frith, 2006), alexithymia (Kinnaird et al., 2019), interoception (DuBois et al., 2016), and self-knowledge/awareness (de Graaff et al., 2023; Greaves-Lord, Kruizinga, et al., 2022).

Construct Validity. The AQ had low reliability in both studies, creating more uncertainty about the results. This might be due to participants being likely predominantly not diagnosed with ASD. Studies validating the AQ with high reliability namely included a large number of participants diagnosed with ASD (Allison et al., 2012; Bertrams & Shah, 2021; Hudson et al., 2024). Items of the AQ are rather heterogeneous, as there are only a few questions examining a broad range of systematically different symptoms. A participant might, for instance, experience executive dysfunctions but not struggle with social interaction, or might collect information on categories of things but at the same time have good central coherence. Reliability might be higher in a sample with a broader range of (clinically relevant) autistic traits. In the first study, the spirituality primer might have confused participants and should not be included again.

Further, more elaborate research should involve a broader sample, as students might not read the instructions of the (mandatory) questionnaires thoroughly (Roszkowski et al., 2014), leaving uncertainty about the questionnaires' validities. Additionally, future research should also include a measure for anxiety, as anxiety is also highly prevalent in people with ASD (Avni et al., 2018; Hollocks et al., 2019) and correlates highly with depression (Gorman, 1996). Additionally, anxiety (similar to other psychopathologies) relates negatively to MiL (Marco et al., 2020). It is also important to think about how depression and MiL can be conceptually disentangled since these two seem to be consistently highly correlated, i.e., those with depression usually struggle with meaning-making through experiencing hopelessness (Kleftaras & Psarra, 2012).

Further, another reason for discrepancies between the first and second study regarding the first research question (**RQ1**), next to the samples being different, could lie in the two different measurement scales for MiL (the MMiL scale and the 3DM). Future research should look into how MiL can be best operationalized in this context, i.e., whether an instrument for measuring MiL in a study with (diagnosed) autistic participants should include *mattering* or *significance* as a subscale, or even both, and whether *MiL judgment* should be included.

External Validity. The convenience samples used in these studies are generally not representative of young adults, and especially not of the clinical population. University students are a certain type of young adult often higher in personality traits such as rationality (Belot et al., 2015), which might have biased especially the rationality variable, and results should not be used to make inferences in an applied setting (Stroebe et al., 2018). The participants in this study also have interests, i.e., psychology and economics/business, which might make them different from the rest of the population, but also different from each other, which might (partly) explain differences in conclusions regarding **RQ1**. Future research should explore whether the relationships found above also hold in a broader sample, particularly including the clinical population.

Clinical Implications and Applications

The present studies mainly investigated how a possible negative relationship between autistic traits and MiL might be explained. Such a negative relationship was partially detected: through mediating effects in both studies and in the first study in the total effect. The ideas for this research had their origin in clinical practice: In communication with the autistic community as well as practitioners specialized in treatment for autistic patients, it became evident that the question for MiL is frequent and relevant (Autisme Team Noord-Nederland, personal communication, June 25, 2024; Greaves-Lord et al., 2023; van den Bosch & Greaves-Lord, 2019). Therefore, although the conclusions from the current study with

students were ambiguous, it will still be clinically relevant to dive deeper into this topic within a clinical setting.

Despite its methodological limitations, this research report can inspire ways of increasing meaning during clinical treatment (or guidance/social support initiatives), e.g., through aiding with setting clear, intrinsic, and thus fulfilling life goals, or by promoting a sensible balance between rationality and intuition (Levin et al., 2015). Increasing feelings of social connectedness, thereby also decreasing loneliness, might additionally be a fruitful approach, for instance through social-skills training such as (components of) PEERS® (Idris et al., 2020; Laugeson et al., 2009), social support work (Dorland et al., 2021; White et al., 2021), or community initiatives that promote social contact in an accessible, not stigmatic fashion (Locke et al., 2024).

The studies above focused on whether MiL in people high in autistic traits could be influenced by certain factors (e.g., comorbid depression). In turn, it would also be interesting to investigate how increasing MiL might affect these factors. The most prominent treatment approaches currently focus on reducing psychopathological symptoms directly (e.g., Sudak, 2012). Instead, it might be more fruitful to focus on positive, constructive meaning-making processes (i.e. creating meaning, rediscovering it in achievable ways) (e.g., van Doornik et al., 2024; Wong, 2015), to actively build a meaningful life and consequently decrease psychopathological symptoms. This positive psychology, or positive health approach (Gable & Haidt, 2005; Huber et al., 2022) could lead to more sustainable change on a deeper level beyond mere symptom reduction.

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Appendix A – Analysis of Duration

Study 1

It was noticeable that the regular mean and variance of duration for questionnaire completion differed highly from the winsorized ones, and skew and kurtosis were exceptionally high. The distribution in Figure 6 shows many outliers who took long to complete the questionnaire. A more detailed inspection revealed that there were 19 robust outliers, who took between 40 minutes and 21 hours to complete the questionnaire. The reasons for these outliers are unknown, but it is likely that some people might need more (and others less) time answering the rather existential questions of the questionnaire. Alternatively, technical difficulties could have been the reason for longer duration times. These outliers did not differ significantly from those who took less time to complete the questionnaire.
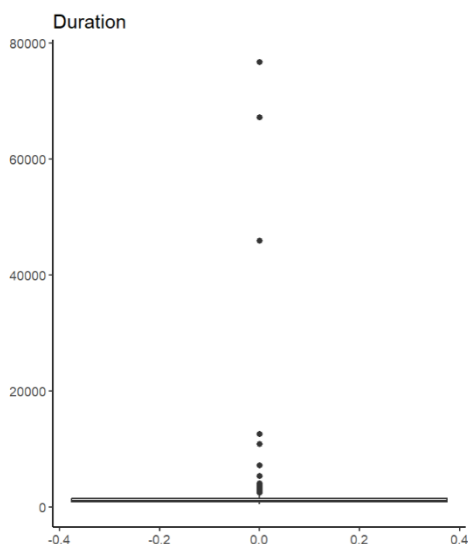
Table 6

Descriptive Statistics of Duration in Seconds

Variable	*M*	*var*	*Win M*	*Win var*	*Skew*	*Kurtosis*
Duration	2 666.60	81 104 974	1 137.35	117 358.70	6.91	48.64

Note. M = mean, *SD* = standard deviation, *Win M* = 10 % winsorized mean, *Win var* = 10 % winsorized standard deviation. Duration is given in seconds.

Figure 6

Boxplot of Duration of Questionnaire Completion in Seconds

Study 2

      Three robust outliers were found who took between 54 and 57 minutes to complete the questionnaire. The regular and robust measures did not greatly differ from each other, and skew and kurtosis were within acceptable range. The three outliers all scored five on the PHQ-2, indicating a bit higher than average depressive symptoms, but not extraordinarily so. Therefore, it was decided to leave these participants in the analysis.
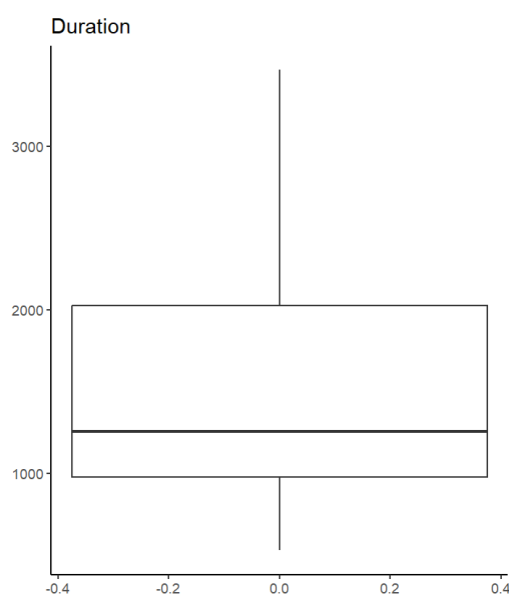
Table 7

Descriptive Statistics of Duration in Seconds

Variable	*M*	*var*	*Win M*	*Win var*	*Skew*	*Kurtosis*
Duration	1 531.73	519 334	1 474.73	276 377.10	0.82	-0.32

Note. M = mean, *SD* = standard deviation, *Win M* = 10 % winsorized mean, *Win var* = 10 % winsorized standard deviation

Figure 7

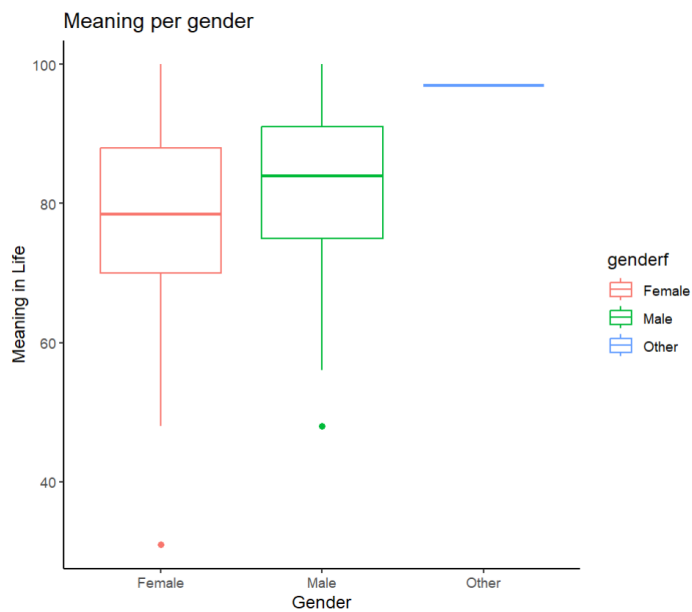*Boxplot of Duration of Questionnaire Completion in Seconds*

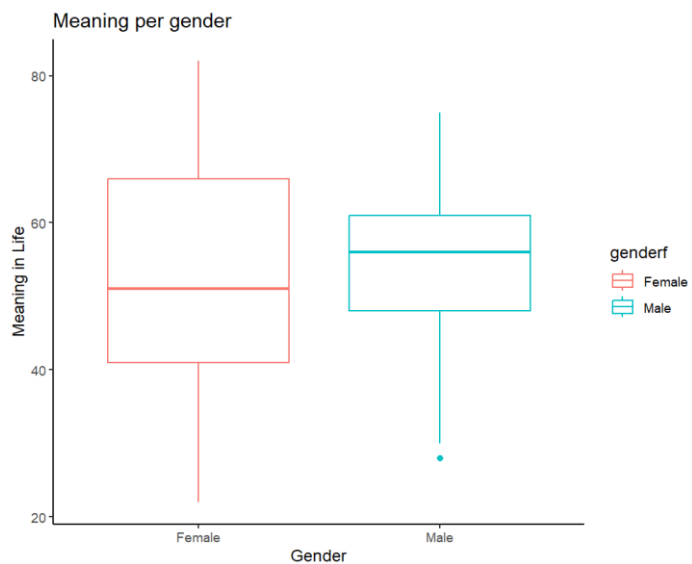**Appendix B – Gender differences for MiL**

Study 1

Figure 8

Gender Differences for MiL

Study 2

Figure 9

Gender Differences for MiL

Appendix C – Regression Analysis results

Study 1

Table 8

Regression Analysis Results

Type	Effect	Model 1 – All variables			Model 2 – Control variables removed			Model 3 – Insignificant Med. removed		
		b (*SE*)	95% CI	*p*	*b* (SE)	95% CI	*p*	*b* (SE)	95% CI	*p*
Indirect	AT → depression → MiL	-0.03 (0.03)	[-0.10; 0.02]		-0.03 (0.03)	[-0.10; 0.02]				
	AT → loneliness → MiL	-0.04 (0.03)	[-0.11; 0.01]		-0.04 (0.03)	[-0.10; 0.02]				
	AT → clarity → MiL	-0.07 (0.03)	[-0.13; -0.02] *		-0.07 (0.03)	[-0.14; -0.02] *		-0.10 (0.04)	[-0.17; -0.04] *	
	AT → concordance → MiL	-0.04 (0.02)	[-0.09; -0.005] *		-0.04 (0.02)	[-0.08; -0.01] *		-0.07 (0.03)	[-0.13; -0.02] *	
Direct	AT → MiL	-0.0002 (0.32)	[-0.63; 0.63]	1.00	-0.10 (0.32)	[-0.73; 0.53]	.86	-0.17 (0.33)	[-0.83; 0.48]	.60
Total	AT → MiL	-0.78 (0.36)	[-2.49; -0.08]	.03*	-0.89 (0.36)	[-1.59; -0.19]	.01*	-0.89 (0.36)	[-1.59; -0.19]	.01*
Control	Age → MiL	0.40 (0.62)	[-0.83; 1.63]	.52						
	Gender → MiL	4.39 (2.50)	[-0.55; 9.32]	.08						
R^2			.39			.37			.26	

Note. SE = Standard Error, CI = confidence interval, Med. = mediators, AT = autistic traits, clarity = goal clarity, concordance = goal self-concordance. *$p < .05$,

** $p < .01$, *** $p < .001$, two tailed. Coefficients (*b*), standard errors and confidence intervals of indirect effects are bootstrapped 1000 times and completely

standardized values are used to improve comparability. Hereby p-values are not available of the indirect effects.

Table 9

Regression Analysis Results – Outliers removed

Type	Effect	Model 1 – All variables			Model 2 – Control variables removed			Model 3 – Insignificant Med. removed		
		b (*SE*)	95% CI	*p*	*b* (SE)	95% CI	*p*	*b* (SE)	95% CI	*p*
Indirect	AT → depression → MiL	-0.03 (0.03)	[-0.08; 0.03]		-0.03 (0.03)	[-0.08; 0.02]				
	AT → loneliness → MiL	-0.02 (0.02)	[-0.7; 0.03]		-0.01 (0.02)	[-0.06; 0.03]				
	AT → clarity → MiL	-0.08 (0.03)	[-0.14; -0.02] *		-0.08 (0.03)	[-0.16; -0.03] *		-0.11 (0.04)	[-0.19; -0.04] *	
	AT → concordance → MiL	-0.04 (0.02)	[-0.10; -0.01] *		-0.04 (0.02)	[-0.09; -0.01] *		-0.06 (0.03)	[-0.13; -0.01] *	
Direct	AT → MiL	0.13 (0.30)	[-0.45; 0.72]	.65	0.03 (0.30)	[-0.56; 0.62]	.92	0.06 (0.31)	[-0.55; 0.67]	.85
Total	AT → MiL	-0.54 (0.34)	[-1.22; 0.13]	.11	-0.65 (0.34)	[-1.32; 0.03]	.06	-0.65 (0.34)	[-1.32; 0.03]	.06
Control	Age → MiL	0.49 (0.61)	[-0.71; 1.69]	.42						
	Gender → MiL	4.37 (2.39)	[-0.35; 9.08]	.07						
R^2		.41			.38			.29		

Note. SE = Standard Error, CI = confidence interval, **p* < .05, ** *p* < .01, *** *p* < .001, two tailed. Coefficients (*b*), standard errors and confidence intervals of indirect effects are bootstrapped 1000 times and completely standardized values are used. Hereby p-values are not available of the indirect effects. Bootstrapped but non-standardized values are used for the total and direct effects. AT = autistic traits, clarity = goal clarity, concordance = goal self-concordance, Med. = mediators.

Study 2

Table 10

Regression Analysis Results

Type	Effect	Model 1 – All variables			Model 2 – Control variables removed			Model 3 – Insignificant Med. removed		
		b (*SE*)	95% CI	*p*	*b* (SE)	95% CI	*p*	*b* (SE)	95% CI	*p*
Indirect	AT → depression → MiL	-0.11 (0.07)	[-0.03; 0.02]		-0.13 (0.06)	[-0.25; -0.01] *		-0.13 (0.07)	[-0.27; -0.01] *	
	AT → social → MiL	-0.03 (0.05)	[-0.14; 0.04]		-0.04 (0.04)	[-0.14; 0.01]				
	AT → rationality → MiL	-0.12 (0.06)	[-0.26; -0.03] *		-0.11 (0.05)	[-0.22; -0.03] *		-0.09 (0.04)	[-0.20; -0.02] *	
	AT → intuition → MiL	0.001 (0.01)	[-0.03; 0.03]		0.01 (0.02)	[-0.03; 0.05]				
Direct	AT → MiL	1.18 (0.39)	[0.40; 1.96] *	.004**	1.34 (0.35)	[0.64; 2.03] *	<.001***	1.17 (0.37)	[0.43; 1.91] *	.002**
Total	AT → MiL	0.08 (0.49)	[-0.90; 1.05]	.87	0.21 (0.45)	[-0.68; 1.11]	.64	0.21 (0.45)	[-0.68; 1.11]	.64
Control	Age → MiL	0.17 (0.55)	[-0.92; 1.26]	.76						
	Gender → MiL	3.15 (2.98)	[-2.78; 9.08]	.29						
R^2		.54			.53			.44		

Note. SE = Standard Error, CI = confidence interval, **p* < .05, ** *p* < .01, *** *p* < .001, two tailed. Coefficients (*b*), standard errors and confidence intervals of indirect effects are bootstrapped 1000 times and completely standardized values are used. Hereby p-values are not available of the indirect effects. Bootstrapped but non-standardized values are used for the total and direct effects. AT = autistic traits, clarity = goal clarity, concordance = goal self-concordance, Med. = mediators.

Table 11

Regression Analysis Results – Outliers removed

Type	Effect	Model 1 – All variables			Model 2 – Control variables removed			Model 3 – Insignificant Med. removed		
		b (*SE*)	95% CI	*p*	*b* (SE)	95% CI	*p*	*b* (SE)	95% CI	*p*
Indirect	AT → depression → MiL	-0.13 (0.08)	[-0.28; 0.04]		-0.35 (0.07)	[-0.26; 0.0001]				
	AT → social → MiL	-0.09 (0.05)	[-0.19; 0.0003]		-0.10 (0.05)	[-0.19; -0.01] *		-0.49 (0.21)	[-0.90; -0.07] *	
	AT → rationality → MiL	-0.12 (0.05)	[-0.26; -0.05] *		-0.12 (0.04)	[-0.22; -0.05] *		-0.47 (0.26)	[-1.07; -0.03] *	
	AT → intuition → MiL	0.01 (0.01)	[-0.02; 0.03]		0.01 (0.02)	[-0.02; 0.05]				
Direct	AT → MiL	1.60 (0.38)	[0.85; 2.36] *	<.001***	1.68 (0.33)	[1.01; 2.35] *	<.001***	1.12 (0.47)	[0.19; 2.06] *	.02*
Total	AT → MiL	0.05 (0.52)	[-0.98; 1.09]	.92	0.17 (0.48)	[-0.78; 1.11]	.36	0.17 (0.48)	[-0.78; 1.11]	.72
Control	Age → MiL	0.15 (0.57)	[-0.97; 1.28]	.79						
	Gender → MiL	2.52 (3.09)	[-3.64; 8.68]	.42						
R^2			.65			.65			.25	

Note. SE = Standard Error, CI = confidence interval, **p* < .05, ** *p* < .01, *** *p* < .001, two tailed. Coefficients (*b*), standard errors and confidence intervals of indirect effects are bootstrapped 1000 times and completely standardized values are used. Hereby p-values are not available of the indirect effects. Bootstrapped but non-standardized values are used for the total and direct effects. AT = autistic traits, clarity = goal clarity, concordance = goal self-concordance, Med. = mediators.

Appendix D – Model Assumptions

Study 1

Independence of residuals seemed not to be violated as fitted values and residuals were not systematically related (see Figure 10, first plot). At the same time, there were three outliers visible in the plot (observations 59, 76, and 95). Looking at the QQ-plot of standardized residuals (Figure 10, second plot), the assumption of normality of residuals did not appear violated, although the same three outliers appeared in the plot. Looking at the first plot again, one could see that the homoscedasticity assumption seemed violated, since the variance of residuals appeared lower for high values. Again, the same three outliers seemed to be extraordinarily large residuals, as could be observed in the third plot. There seemed to be no influential observations judging from the fourth plot of Figure 10, however there were some outliers (observations 76, 95, and 114). VIF values of predictors were all close to one, which indicated absence of multicollinearity and that the independence of predictors assumption was not violated.

Figure 10

Assumption Checks of model 2 – all mediators
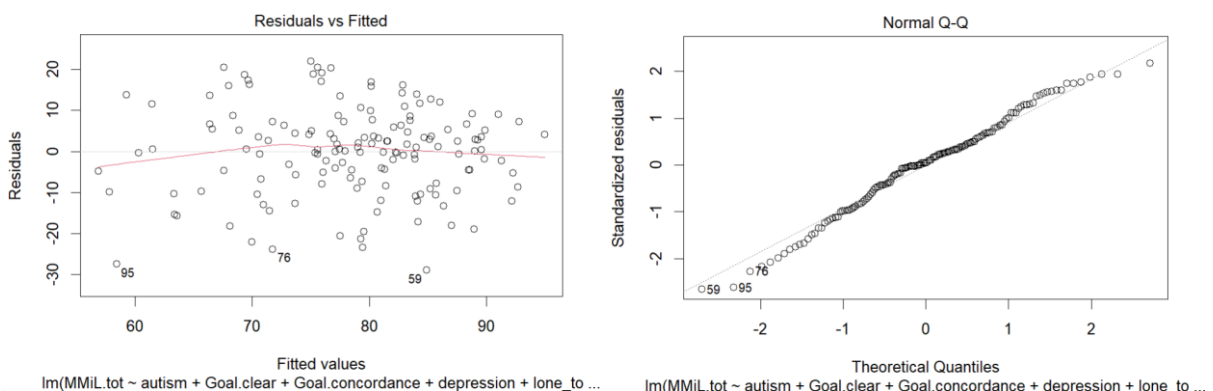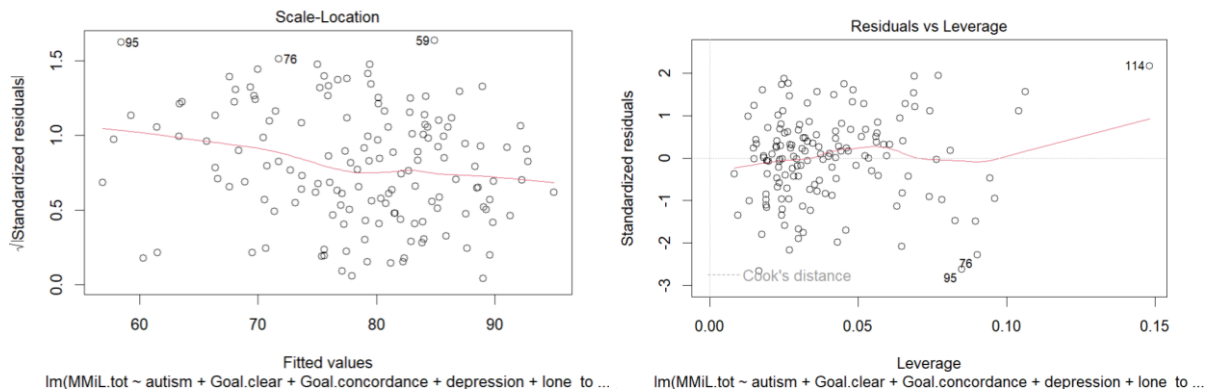
Study 2

The independence of residuals assumption did not seem to be violated, as could be judged from the first plot in Figure 11. However, observations 12, 18, and 31 were observed as outliers. The residuals seemed to be roughly normally distributed, indicating no violation of the second assumption, judging from the second plot of Figure 11. Again, the same three outliers were observed. Looking again at the first plot, it seemed like the homoscedasticity assumption might be violated, as variance of residuals appeared slightly lower for higher fitted values. Abnormally large residuals could be observed in the third plot, again for observations 12, 18, and 31. Although there appeared to be no influential observations in plot four, there were three outliers, observations 12, 18, and 20. As all VIF values were close to one, the predictors seemed to be independent enough for no multicollinearity to be present.

Figure 11

Assumption Checks for Model 2 – All Mediators