The Impact of Loneliness and Social Relationship Dissatisfaction on Clinical and Functional Outcomes in Dutch Mental Health Service Users

Abstract

The relationship between reduced social connectedness and mental health outcomes is increasingly acknowledged. Yet, relatively little is known about how two crucial subjective aspects of social disconnectedness - loneliness or social relationship dissatisfaction (SRD) - are related to clinical and functional recovery. This cohort study aimed to investigate the association of loneliness and SRD with various mental health outcomes among 15,512 outpatients from a Dutch mental health service. Demographics and data on loneliness, SRD, symptomatic distress, suicidal ideation, and role functioning, as well as treatment duration, and mortality, were collected. The study analyzed the association between these factors overall and by diagnostic group, gender, and age, using cross-sectional and longitudinal regression, while controlling for relevant covariates. Findings revealed significant, independent, associations between loneliness, SRD, symptomatic distress, and role functioning across different diagnostic groups. Particularly strong associations were noted in bipolar and psychosis-related disorders. Gender did not significantly influence the strength of associations. In older patients, lower levels of loneliness and SRD were observed, but the impact on clinical and functional outcomes was consistent across ages. Higher loneliness and SRD were associated with longer treatment durations, regardless of age, gender or diagnosis. This study indicates the wide-reaching effects of perceived social disconnectedness on recovery and emphasizes interventions targeting loneliness and SRD to enhance outcomes.

Key words: Social relationship dissatisfaction, loneliness, symptomatic distress, role functioning, time to discharge

1. Introduction

Reduced social connectedness is common in mental health disorders and has been associated with negative mental health outcomes and increased mortality rates (1-6). The associations are thought to be mediated through physiological and psychological pathways, such as chronic stress responses, effects on the immune response, and behavioural changes like decreased physical activity (7). Social disconnectedness can result from a range of interrelated constructs, encompassing subjective and objective dimensions, including a lack of social support, social networks, and perceived social isolation (8). The absence of social contacts, a small social network or the absence of friends or a partner reflects an objective lack of social connectedness and is commonly referred to as social isolation. In contrast, the subjective dimensions of social disconnectedness may include loneliness (i.e., a perceived lack of belonging or difference between desired and actual social relationships in terms of quantity and quality), perceived social support (i.e., people's beliefs about how much support is available from their social connections and the quality thereof), and relationship satisfaction (i.e. individuals' subjective global evaluation of the quality of their relationships) (9-11).

Research shows that the correlations between the objective and subjective aspects of social connectedness are relatively modest (12, 13). That is, some individuals feel subjectively unhappy about aspects of their social relationships, despite having frequent social contacts, whereas others may be content, despite smaller social networks or a lower frequency of social contacts. Relatedly, it has been found that being in a relationship per se is not necessarily protective for mental health. Difficult relationship may increase psychological distress, anxiety, and worry. For example, epidemiological research by Leach and colleagues (2013) showed that the association between relationship status and mental health was moderated by relationship quality, whereby only good-quality relationships were related to better mental health than being single. However, for females in particular, being in a low-quality relationship was associated with greater levels of anxiety than being single (14). Similarly, Till et al. (2016) found higher levels of suicidal ideation, hopelessness, and depression in individuals who experienced low satisfaction with their relationship, compared to those were either satisfied or single (15). Together these findings highlight that it is particularly important to investigate individuals' perceptions of their social connections.

Indeed, loneliness, low social relationship satisfaction and reduced perceived social support are related to diminished psychological well-being, poorer mental health, and suicidal ideation in both general and clinical populations (16-22). Wang et al. (2018) reviewed the available evidence on associations between loneliness and perceived social support and mental health outcomes. Their findings yielded the strongest evidence for associations between reduced perceived social support and poorer patient outcomes in terms of symptoms, recovery and functioning in depression. The authors concluded that the evidence on loneliness and its impact on mental health outcomes was still limited and that further evidence was needed for other mental health conditions (9). Furthermore, the reviewed studies often had small and selective samples and short follow-up durations, leaving questions about the long-term effects of reduced social connectedness on outcomes in diverse patient populations. Finally, little is known about the predictive associations between relationship satisfaction and treatment outcomes in mental health care settings.

In our study, we therefore focussed on two separate, subjective aspects of subjective social disconnectedness: loneliness and social relationship dissatisfaction (SRD) to explore their differential associations with clinical and functional outcomes (i.e., symptomatic distress, suicidal ideation, treatment duration and role functioning), and mortality. We cover a wide range of disorders in a community mental health setting across the adult lifespan, making this the largest cross-diagnostic investigation of its kind. Previous research has demonstrated a significant relationship between loneliness and relationship satisfaction, but with a small to moderate effect size (23). We therefore hypothesized that loneliness and SRD would independently relate to recovery outcomes of symptomatic distress and functioning, cross-sectionally and longitudinally. We anticipated that greater loneliness and SRD would predict longer treatment durations, increased symptomatic distress and heightened suicidal ideation, poorer role functioning, and higher mortality.

2. Methods

2.1. Design and data source

This retrospective observational cohort study utilized standard outcome measures collected after referral and prior to end of treatment in the integrated community mental health GGZ Noord-Holland-Noord (GGZ NHN), the main provider of mental health care in an area in the North-Western part of the Netherlands. The catchment area is both rural and urban and the service provides ambulatory and inpatient care.

2.2. Study cohort

The cohort included individuals treated in ambulatory community mental health teams of the GGZ NHN between February 2010 and August 2023. All individuals had a diagnosis of a mental health disorder according to Diagnostic and Statistical Manual (DSM III, IV and 5), were aged ≥ 18 and completed at least one Outcome Questionnaire (OQ)-45 assessment within six months after referral (mean time of OQ-45 completion after referral = 1.85 months (SD = 1·41)). The included cohort comprised 15,512 patients (for attrition see Supplementary Table 1). Treatment took place in three different divisions: integrated community mental health (an integration of Flexible-Assertive Community Treatment and disorder specific teams), acute and forensic (hospitals, acute response and forensic teams), and basic mental health care (teams for monodisciplinary treatment). For sample characteristics see Table 1.

2.3. Measures

Demographic variables included age, gender (self-report), nationality (Netherlands born vs. born elsewhere), relationship status (single vs. in a relationship), living situation (with partner (with/ without children) alone (with/without children), in mental health inpatient setting, homeless and other), and mortality (yes/no). Primary diagnoses included were psychotic disorder, bipolar disorder, depressive/dysthymic disorder, anxiety disorder, neurodevelopmental disorder, personality disorder, trauma and stress related disorders and a category other (e.g., psychiatric disorder not otherwise

specified). Comorbid diagnoses were not consistently reported and, therefore, not included in the analyses. Additionally, we included data on treatment setting (divided into integrated community mental health care, acute and forensic mental health care, basic mental health care), treatment duration, and number of previous mental health care referrals.

Outcome Questionnaire-45 (OQ-45.2). The Dutch version of the OQ-45(24) is a 45-item self-report measure designed to assess progress in psychotherapy, as well as real-world functioning, through the subjective experience of a person. It is among the most frequently used outcome measures in the Netherlands(25). OQ questions are scored on a 5-point Likert scale ranging from never (0) to almost always (4). The OQ includes an *Interpersonal Relations* subscale which combines loneliness, conflict with others and marriage/relationship and family difficulties. Here we separately examine the OQ item loneliness (1 item *"I feel lonely")* and items relating to social relationship dissatisfaction with partners and family (SRD; 4 items, range 0-16), given that they may relate differentially to recovery outcomes. As per OQ instructions, individuals without a partner were asked to answer the question "*I am unhappy with my marriage/relationship"* with 0, suggesting 'satisfied'). In addition, we examined symptomatic distress (25 items, range 0-100) and role functioning at school or work (8 items, range 0-32). To explore the impact of loneliness and SRD on suicidal ideation, we separately focused on the OQ item "*I think of ending my life*". On all subscales, items are scored or reverse-scored (9 items), with higher scores representing more negative outcomes, like increased loneliness and symptomatic distress. The total OQ-45 scores range from 0 to 180, with total scores of more than 56 considered clinically relevant in Dutch samples.

2.4. Statistical analyses

Analyses were conducted in IBM SPSS Statistics 27. Characteristics were compared between diagnostic groups, genders and ages using regression analyses or chi-square tests (supplementary tables 1-6). Spearman correlations were run for different study measures were (Table 2). An adjusted *p*-value threshold of 0·0125 (0·05 ÷ 2 (loneliness and SRD measures) * 2 statistical models for (1) main effects and (2) interaction effects) was used in all models to account for multiple comparisons.

The strengths of the effects were annotated with the partial Eta squared (η^2) for which, according to the rule of thumb, 0.01 indicates a small, 0.06 a medium, and 0.14 a large effect.

Baseline associations. Univariate regression models including loneliness and SRD, along with interactions with (i) diagnosis, (ii) gender, and (iii) age, were used to examine cross-sectional associations between loneliness, SRD, and clinical outcomes (symptomatic distress and suicidal ideation) and role functioning at baseline (defined as the first assessment within 6 months from treatment start). Covariates included treatment division, previous referrals, age, gender, and diagnosis (when not explicitly studied).

Due to small numbers of clients in the older age ranges, age at baseline assessment was truncated to 18-67 for the main analyses (i.e. ages > 67 were recoded into 67, the Dutch retirement age). Quadratic or cubic terms of the main predictor were entered into the model if there was evidence of a possible non-linear relationship and compared with the linear models in terms of model fit. Adding these terms changed the explained variance of the models by no more than $R^2 = \cdot 002$, and we therefore treated associations as linear. For the multivariate analysis including diagnostic groups, additional moderation analyses by Johnson-Neyman (using the PROCESS command) were run to examine the origin of significant interaction effects (26).

Longitudinal associations. We examined the longitudinal effects of loneliness and SRD at baseline on clinical outcomes (symptomatic distress and suicidal ideation) and role functioning in the retest sample (i.e. clients with a second available data point at least 3 months after first assessment (mean duration between first and second assessment = 20 months, SD = 19·46, range = 3-155 months)). This analysis utilized regression models, like those described above, but additionally controlled for baseline levels of symptomatic distress, suicidal ideation, and role functioning, the duration between baseline and the last available follow-up assessment, as well as the level of change in loneliness and SRD from baseline to follow-up. Additionally, associations between loneliness and SRD at baseline, treatment duration, and mortality were investigated using Cox regression models, using the same covariates.

Sensitivity analyses

Analyses where repeated for individuals who were single versus in a relationship, which we considered important with respect to our outcome SRD, as being single might have impacted the ratings differently. We also conducted sensitivity analyses for individuals beyond the Dutch retirement age (age 67), given that there may be important effects of leaving employment on loneliness and SRD. A final set of sensitivity analyses were conducted for those who were in care during (one of the) complete COVID-19 pandemic related lockdowns versus those that were not, to examine whether the effects might have been amplified. All sensitivity analyses are presented in the Supplementary Materials.

2.5. Role of the funding source

No funding source had any role in study design, collection, analysis, and interpretation of data, in the writing of the report, and in the decision to submit the paper for publication.

3. Results

3.1. Sample characteristics

The overall sample comprised 15,512 individuals aged 18 to 99 years with an average age of 37·41 (SD = 13·93) years (61·5% female), see Table 1. As denoted in the note of this table, for some individuals (socio)demographic data was missing, and they were therefore excluded from our analysis sample. These individuals represented a clinically less severe sample, characterized by significantly shorter treatment durations and lower severity scores on all of the primary outcome measures of the study (range p = ·001-p < ·001). Of the study sample, 6,412 completed at least one additional OQ-45 during their treatment period after a minimum duration of three months after the six-months baseline assessment period. We used the last available OQ-45 assessment (mean follow-up duration = 19·41 months (SD = 17·71), range = 3 – 153 months). See Supplementary Table 1 for all differences in characteristics between individuals who completed assessments at one versus two timepoints (retest subsample). Individuals with only one available assessment were more often male, single, and from non-Dutch origin, presented with less severe clinical symptoms, and had shorter treatment durations compared to those with available data at two timepoints.

The correlation between loneliness and SRD at baseline assessment was r = ·47 (for intercorrelations between all study variables, see Table 2). For the distributions of loneliness and SRD at baseline, see Supplementary Figure 1. An overview of the sample characteristics stratified by diagnosis, gender, and age is shown in Supplementary Tables 2 to 4. An overview of the characteristics of the retest sample stratified by diagnostic group at follow-up is shown in Supplementary Table 5.

3.2. Cross-sectional associations between loneliness, SRD and clinical and functional outcomes

Univariate regression models in the overall sample that included both loneliness and SRD as predictors showed that both were independently and significantly associated with symptomatic distress at baseline (loneliness: F(1,13225) = 2466·27, η^2= ·16 , p < ·001; SRD: F(1, 13225) = 2449·43, η^2= ·16, p < ·001;). Slightly weaker baseline associations were apparent between SRD, loneliness, and role functioning (loneliness: F(1,13225) = 336·78, η^2= ·03, p < ·001, SRD: F(1, 13225) = 1458·17,

η^2= ·10 , *p* < ·001). One-thousand nine-hundred ninety-seven (12·87%) patients reported regular suicidal ideations at baseline. Analyses revealed that both loneliness and SRD (loneliness: F(1,13225) = 843·71, η^2= ·04 , p < ·001; SRD: F(1, 13225) = 421·20, η^2= ·03, *p* < ·001) had an independent and positive association with the strength of suicidal ideation, holding that individuals who felt less socially connected reported more severe suicidal ideations.

Diagnosis specific associations. There were significant loneliness-by-diagnosis (F(7,13211) = 3·07, η^2= ·002, p = ·003) and SRD-by-diagnosis (F(7,13211) = 8·22, η^2= ·004, *p* < ·001) interactions on symptomatic distress. For loneliness and SRD significant associations with symptomatic distress were apparent for all diagnoses. However, associations between loneliness and symptomatic distress were most pronounced for individuals with a bipolar spectrum diagnosis (Supplementary Figure 2 shows diagnosis specific cross-sectional associations). Associations between SRD and symptomatic distress were also particularly pronounced for individuals with a disorder in the bipolar spectrum, as well as for those with a diagnosis in the psychosis spectrum. This finding suggests that at low levels of loneliness and SRD these groups had relatively lower levels of symptomatic of distress compared to the other diagnosis groups; a difference that was no longer apparent at higher levels of loneliness or SRD.

The loneliness-by-diagnosis interaction for suicidal ideation did not reach statistical significance (*p* = ·15).The SRD-by-diagnosis interaction for suicidal ideation was significant at trend level (F(7,13211) = 2·32, η^2= ·001, *p* = ·02), with patterns for psychosis and bipolar diagnoses similar to those for symptomatic distress.

Loneliness-by-diagnosis and SRD-by-diagnosis interactions for role functioning did not reach statistical significance (for both *p* = ·04).

Gender specific associations. While females reported higher levels of loneliness and symptomatic distress than males, males reported significantly higher SRD and suicidal ideation and poorer role functioning than females (Supplementary Table 3). However, our results suggest that the strength of

the associations between loneliness, SRD and clinical or functional measures did not differ between genders (range $p = \cdot 14$ to $p = \cdot 51$).

Age specific associations. Older individuals reported lower levels of loneliness and SRD compared to younger ones (Supplementary Table 4). Analyses revealed a significant loneliness-by-age interaction at baseline assessment ($F(1,13223) = 11 \cdot 71$, $\eta^2 = \cdot 001$, $p < \cdot 001$), showing that the cross-sectional association between loneliness and symptomatic distress was marginally weaker for older than younger individuals (Supplementary Figure 3). Similar interactions were apparent for suicidal ideation where associations with both loneliness and SRD were somewhat weaker for older individuals (loneliness: ($F(1,13223) = 28 \cdot 35$, $\eta^2 = \cdot 002$, $p < \cdot 001$; SRD: ($F(1,13223) = 7 \cdot 14$, $\eta^2 = \cdot 001$, $p < \cdot 001$). No interaction was found for SRD-by-age on symptomatic distress ($p = \cdot 07$). For role functioning, similar age-related differences with weaker associations with increasing age were apparent for loneliness (loneliness-by-age: ($F(1,13223) = 9 \cdot 92$, $\eta^2 = \cdot 001$, $p = \cdot 002$) and SRD (SRD-by-age: ($F(1,13223) = 10 \cdot 75$, $p = \cdot 001$; Supplementary Figure 4).

3.3. Longitudinal associations between loneliness, SRD and clinical and functional outcomes

We found that in the overall re-test sample loneliness and SRD at baseline were both independent, significant predictors of symptomatic distress at the last available follow-up (loneliness: $F(1,6682) = 455 \cdot 07$, $\eta^2 = \cdot 06$, $p < \cdot 001$; SRD: $F(1,6682) = 562 \cdot 47$, $\eta^2 = \cdot 08$, $p < \cdot 001$). Loneliness and SRD were also both independently and significantly associated with the severity of suicidal ideation at follow-up (loneliness: $F(1,6682) = 382 \cdot 84$, $\eta^2 = \cdot 04$, $p < \cdot 001$; SRD: $F(1,6682) = 77 \cdot 23$, $\eta^2 = \cdot 01$, $p < \cdot 001$). Similarly, loneliness and SRD were both independently and significantly associated with role functioning at follow-up (loneliness: $F(1,6682) = 123 \cdot 84$, $\eta^2 = \cdot 02$, $p < \cdot 001$; SRD: $F(1,6682) = 476 \cdot 65$, $\eta^2 = \cdot 07$, $p < \cdot 001$).

Diagnosis specific associations. No significant loneliness-by-diagnosis interactions were apparent for any of the clinical outcomes or role functioning. A significant SRD-by-diagnosis ($F(7,6668) = 4 \cdot 71$, $\eta^2 = \cdot 005$, $p < \cdot 001$) interaction on symptomatic distress suggests that the magnitude of the associations

differed between diagnoses. Associations between SRD and symptomatic distress at follow-up were most pronounced for individuals with a primary diagnosis of a psychotic disorder. Similar to cross-sectional findings, at low levels of SRD these groups had relatively lower levels of symptomatic of distress compared to the other diagnosis groups. (Figure 1). No significant SRD-by-diagnosis interaction was apparent for suicidal thoughts, or for role functioning.

---- Figure 1 here -

Gender specific associations. There were no significant gender-by-loneliness or gender-by-SRD interactions on symptomatic distress, suicidal ideation, or role functioning at last assessment.

Age specific associations. Non-significant age-by-loneliness and age-by-SRD interactions showed that associations between loneliness and SRD at baseline assessment on symptomatic distress at follow-up were similar across ages (loneliness: F (1,6680) = ·02, η^2= 0, *p* = ·88; SRD: F(1,6680) = ·62, η^2= 0, *p* = ·43). We did observe significant but small age-by-loneliness (F(1,6680) = 7·15, η^2= ·001, *p* = ·008) and age-by-SRD interactions (F (1,6680) = 7·72, η^2= ·001, *p* = ·005) on suicidal ideation, such that associations were slightly weaker for older individuals.

There were no significant interactions between age and loneliness or SRD on role functioning (loneliness: F (1,6680) = 1·71, η^2= 0, *p* = ·19; SRD: F (1,6680) = ·43, η^2= 0, *p* = ·51).

3.4. Loneliness, SRD, treatment duration and mortality

Cox regression analyses revealed significant relationships between loneliness and SRD at baseline and treatment duration (loneliness: B = -·05, SE = ·009, Wald = 7·36, *p* =·007, OR = 1·13 (CI95%=1·04-1 ·21); SRD: B = -·14, SE = ·05, Wald = 23·62, p<.001, OR = 1·05 (CI95% =1·03-1·96), suggesting that clients who felt lonelier and experienced more SRD remained in treatment for longer.

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No significant interactions were found between SRD and age or gender on treatment duration (range p = ·15 – p = ·77). We did observe a small, but significant, loneliness-by-diagnosis interaction (B = -·02, SE = ·007, Wald = 9·21, p = ·002, OR = 1·02 (CI95% = 1·01 - 1·03)), such that loneliness had a particular pronounced effect on treatment duration for individuals with a diagnosis in the trauma (B = -·31, SE = ·06, Wald = 24·60, p < ·001, OR = 1·26 (CI95% = 1·17 - 1·35)), or anxiety spectrum (B = -1·11, SE = ·04, Wald = 6·81, p = ·009, OR = 1·10 (CI95% = 1·03 - 1·17)).

Cox regression analyses did not reveal a significant association between loneliness, SRD, and mortality (loneliness: B = ·10, SE = ·17, Wald = ·35, p = ·55, OR = 1·11; SRD: B = -·02, SE = ·06, Wald = 1·73, p = ·68, OR = ·98; loneliness).

See Supplementary Results and Supplementary Table 6 for sensitivity analyses in which analyses where repeated for (1) individuals that were single versus in a relationship, (2) individuals beyond the retirement age of 67, and (3) individuals who were in care during (one of the) full COVID-19 pandemic related lockdowns versus those that were not.

4. Discussion

In our study, we found that loneliness and dissatisfaction with social relationships (SRD) independently and significantly predicted clinical outcomes and role functioning at their longest available follow-up assessment in a Dutch community mental health service. This impact was consistent across various diagnostic groups, although variable in strength. These findings underscore the importance of addressing both aspects of social connectedness for improving patient recovery outcomes, irrespective of their diagnosis.

4.1. Group differences in loneliness and social relationship dissatisfaction, clinical and functional outcomes

Among our study cohort, where about half were single, we found that about 16% of individuals reported that they often felt lonely. This rate of loneliness is higher compared with the general Dutch population, where 9% report frequent loneliness, with rates around 14% in singles and single parents (27). Interestingly, while individuals who were single reported more loneliness and SRD compared with individuals who were in a relationship, we found no significant differences in the associations between loneliness or SRD and any of the outcome measures.

The prevalence of loneliness and SRD differed between diagnostic groups. While individuals with psychotic disorders were likely more often alone due to their living and relationship status (Supplementary Table 2), individuals with depression, personality disorders, and trauma-related disorders reported significantly higher levels of loneliness and higher SRD compared to those with other diagnoses. The three diagnostic groups also presented with the highest levels of symptomatic distress and suicidal ideation. Individuals diagnosed with a depression or personality disorders were least satisfied with their role functioning, closely followed by developmental disorders.

Significant gender differences were also observed. Females reported significantly higher loneliness and greater symptomatic distress than males. However, SRD and suicidal ideation were significantly higher in males. Also, reported role functioning was significantly lower in males than females (Supplementary Table 3). Higher levels of loneliness in females have been found in a Dutch (28) population study, though large meta-analyses suggest gender differences may be small (29).

Furthermore, while some evidence supports slightly less marital satisfaction in women, especially in help-seeking populations (30), the differences in SRD might be influenced by variability across studies. Previous research suggested that males might under-report loneliness (31) and mental health symptoms (32), suggesting that clinicians should actively probe for possible problems with respect to social connectedness in all clients.

Loneliness, SRD, symptomatic distress, suicidal ideation and reported role functioning remained fairly consistent over time among participants aged 18-55. Interestingly, there was a significant improvement beyond age 55, particularly after retirement (Supplementary Table 4). Several factors may explain this improvement. As people age, they tend to prioritize positive social experiences and minimize negative ones, seeking harmonious interactions. As a result, they may feel less lonely and dissatisfied with their relationships (33). Conversely, lonely older adults may not actively seek mental health support, although research suggests they utilize healthcare services more frequently than non-lonely counterparts (34). There is a possibility that older individuals have become accustomed to or accepted feelings of loneliness, but this is contradicted by research showing a second peak in loneliness in older ages (35). Finally, individuals in the oldest group face fewer role functioning demands and may therefore be more likely to evaluate their functioning more positively.

4.2. Associations between loneliness, SRD and clinical and functional outcomes

Cross-sectionally, both loneliness and SRD independently explained variation in symptomatic distress, suicidal ideation, and role functioning. Although significant links were observed between loneliness, SRD, and symptomatic distress and suicidal ideation across all diagnoses, they were particularly pronounced in individuals with bipolar and psychosis-related disorders. This pattern was due to the fact that, at low levels of SRD, these groups exhibited relatively lower levels of distress symptoms compared to other diagnostic groups.

Our longitudinal analyses addressed the directionality of these links, showing that both loneliness and SRD at baseline independently predicted symptomatic distress and suicidality at the last follow-up. In particular, loneliness at baseline was associated with the strength of suicidal ideations at

follow-up. Individuals with a psychotic disorder showed slightly lower SRD and loneliness at baseline than other groups. The interaction showed that in individuals with a diagnosis in the psychosis spectrum and bipolar disorder, low loneliness and SRD at baseline were associated with particularly low symptomatic distress at follow up, compared to other diagnostic groups. These group differences disappeared at higher levels of loneliness and SRD at baseline. That is, high loneliness and SRD predicted high levels of symptomatic distress at follow-up in all diagnostic groups, suggesting that loneliness and SRD warrants universal clinical attention. Loneliness and SRD were moderately strongly correlated, yet their individual significant associations with clinical underline their significance as separate factors important for clinical and functional outcomes in clinical settings.

For all diagnoses, loneliness and SRD were independently linked to role functioning at follow-up, though effects were smaller than for symptomatic distress. Overall, SRD appeared more important for aspects of role functioning than loneliness. It is likely that good social relationships with family, friends and colleagues facilitate proactive coping processes that help to enhance role functioning (36).

In summary, our analysis indicates that loneliness and SRD significantly influence clinical and role functioning outcomes, both cross-sectionally and over time, in all major diagnostic groups. This underscores the vital role of social connectedness in key aspects of recovery. No differences in the strength of associations were found across genders and ages, highlighting the importance of addressing social connectedness universally.

4.3. Associations between loneliness, SRD, treatment duration and mortality

Notably, higher levels of loneliness and SRD predicted longer treatments, regardless of diagnosis, age or gender. Social connectedness could affect recovery speed through its effects on coping, service engagement, or medication adherence, and perceptions of patient self-sufficiency. Additionally, the desire for social connections or improved social connections may lead individuals who are experiencing more loneliness or SRD to prefer longer treatments. This has important implications for

the burden on mental health care services and associated costs, which may be alleviated by addressing social connectedness early in the treatment process.

In our study, with a less than 1% all-cause mortality rate, neither loneliness nor SRD predicted mortality, contrary to a large meta-analysis (37). The meta-analysis included various measures of social relationship functioning and had a significantly older average age (63·9 years vs. 37·8 years in our sample), with 29% mortality over the follow-up period. Additionally, only 24% of the studies in the meta-analysis focused on outpatients. These differences in study populations and definitions of social connectedness may account for the disparities in findings. Given the low mortality rate the current findings should be interpreted cautiously. Further research is needed to examine associations between social connectedness and mortality, while carefully considering age, diagnosis and setting.

4.4. Strengths and Limitations

This study offers valuable real-world insights into the associations between two different subjective aspects of social connectedness and clinical and functional recovery outcomes, obtained through standard care assessments. This real-world approach limited the scope of analysis, precluding consideration of potential moderators like (social) cognitive functioning or personality traits, which relate to social connectedness (38, 39). Additionally, due to data constraints, more objective data on role functioning, and details such as treatment type, nature of social relationships, socioeconomic and neighbourhood factors were not explored, hindering a comprehensive understanding of their impact on outcomes. Furthermore, we did not have reliable records of comorbid diagnoses in the current dataset, as such the impact of comorbidity could not be investigated. Finally, while evidencing the importance of SRD and loneliness for recovery, this study does not elucidate the underlying mechanisms. For example, it is possible that the different aspects of social connectedness may influence symptomatic distress and suicidality through factors like treatment adherence (40) or improved coping (36), which were not assessed in this study. It is likely that the drivers of SRD and loneliness vary across diagnoses, genders, and ages, suggesting the need for tailored interventions.

4.5. Conclusions

Our study sheds light on the relationship between loneliness and SRD with clinical and role functioning across various mental health conditions in real world clinical settings. This understanding is crucial for creating tailored interventions that address specific unmet needs related to two important subjective aspects of social disconnectedness. Our findings indicate that both loneliness and SRD are significant concerns for outpatients in the Netherlands. Interventions aimed at reducing loneliness and enhancing social relationship satisfaction could greatly benefit patients' clinical and functional recovery. Currently, there are only a few effective interventions available for these issues.

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Contributors. EV and AF contributed to study conceptualisation and co-wrote the first draft. EV conducted all statistical analyses. EV and AF interpreted the results. All authors edited or substantively reviewed the publication and contributed to additional interpretation of the results. All authors based at GGZ NHN had full access to all the data reported in the study. AF inspected the output files. EV and EvdP directly accessed and verified the underlying data reported in the manuscript. All authors approved the final version of the publication. All authors had final responsibility for the decision to submit for publication. All authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work could be appropriately investigated and resolved.

Conflicts of interest. We declare no competing interests.

Data sharing. Due to data protection reasons, the data analysed for this manuscript cannot leave the protected server of GGZ NHN.

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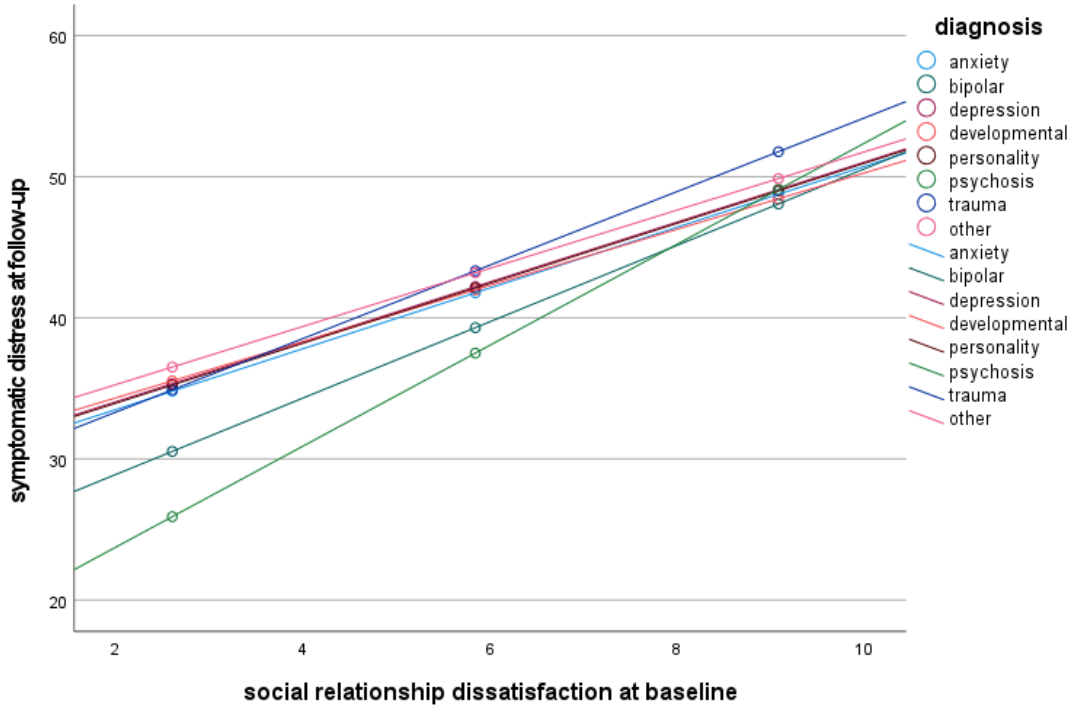


Figure 1. Association between social relationship dissatisfaction (SRD) at baseline assessment and symptomatic distress at follow-up by diagnostic category.
Analyses are controlled for: age, gender, treatment setting, previous referrals, baseline loneliness, change in loneliness between baseline and follow-up, change in SRD between baseline and follow-up, duration between first and last assessment. Diagnosis specific-association: psychosis (effect = 3·58, CI95% 3·03, 4·13, p < ·001), anxiety (effect = 2·15, CI95% 1·94, 2·37 p < ·001), bipolar disorder (effect = 2·71, CI95% 2·34, 3·08, p < ·001), depression (effect = 2·12, CI95% 1·94, 2·30 p< ·001), developmental (effect = 1·99, CI95% 1·75, 2·23, p < ·001), personality (effect = 2·13, CI95% 1·84, 2·41, p< ·001), trauma (effect = 2·61, CI95% 2·34, 2·87, p < ·001), and other disorders (effect = 2·06, CI95% 1·72, 2·40 p< ·001).

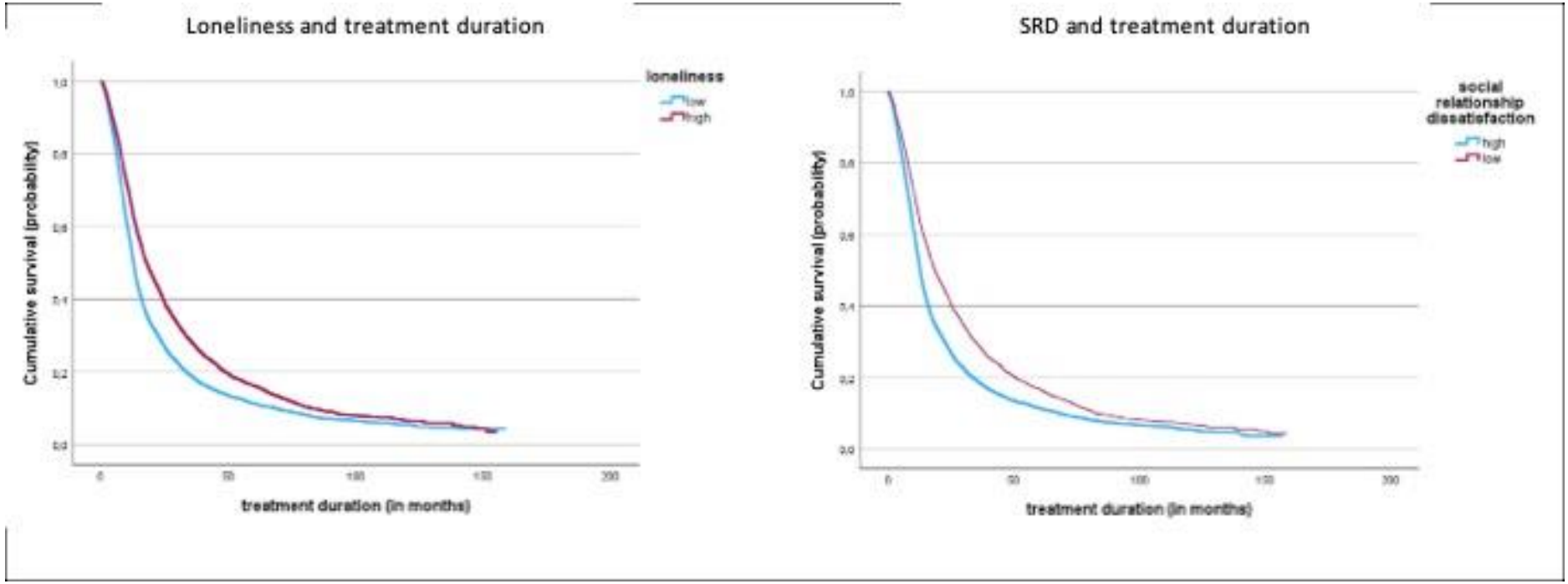


Figure 2. Kaplan Meier curves displaying the cumulative probability (i.e. survival (y-axis)) of receiving mental health care after x months (see x-axis) given high versus low levels loneliness and SRD at baseline.

Table 1. Sample characteristics for the overall sample

Patient characteristics GGZ NHN		**N = 15,512**
Age (m, sd)		37·38 (13·97)
Gender, female (n, %)		9,460 (61·50)
Netherlands born[1] (n, %)		13,675 (91·50)
Single[2] (n, %)		5,229 (46·40)
Living situation[3] (n, %)		
	Alone	3,414 (23·50)
	With parent(s)	2,580 (17·70)
	With partner (with/ without kids)	6,694 (46·00)
	Alone, with kids	1,220 (8·40)
	(Mental health) institute	59 (0·40)
	Homeless	31 (0·20)
	Other	559 (3·80)
Primary diagnosis[4] (n, %)		
	Psychotic disorder	302 (2·30)
	Bipolar disorder	521 (3·90)
	Depressive/ Dysthymic disorder	3,734 (28·10)
	Anxiety disorder	2,732 (20·60)
	Neurodevelopmental disorders	2,113 (15·90)
	Personality disorder	1,207 (9·10)
	Trauma and stress related disorders	1,512 (11·40)
	Other[5]	1,363 (8·80)
Division[6] (n, %)		
	Integrated community mental health care	12,458 (81·10)
	Acute & forensic mental healthcare	538 (3·50)
	Basic mental health care	2,340 (15·30)
OQ Loneliness (m, sd)		2·34 (1·11)
OQ SRD (m, sd)		5·72 (3·23)
OQ SRD average score per item (m, sd)		1.43 (·81)
OQ RF (m, sd)		13·67 (5·27)
OQ RF average score per item (m, sd)		2·09 (·62)
OQ SD (m, sd)		52·27 (15·45)
OQ SD average score per item (m, sd)		1·71 (·66)
OQ suicidal ideation (m, sd)		1·06 (1·13)
OQ suicidal ideation, at least frequent (n, %)		1,997 (12·90)
Mortality (n, %)		109 (0·7)
Treatment duration in months (m, sd, range)		18·72 (20·56), range 0-158
Previous GGZ NHN referrals (m, sd, range)		0·87 (1·25), range 0-14

Note: [1]data missing on n = 571; [2]data missing on n = 4,246; [3]data missing on n = 955; [4] data missing on n = 2,228.[5]Other diagnoses included (amongst others) psychiatric disorder NOS, undifferentiated somatoform disorder (NOS), non-specified psychiatric disorder, hypochondria, behavioral disorder NOS, alcohol dependence, cannabis

dependence; [6]data missing on n=176. Abbreviations. GGZ NHN = Geestelijke Gezondheidszorg Noord-Holland-Noord, OQ = Outcome Questionnaire, SRD = social relationship dissatisfaction, SD = symptomatic distress, RF = role functioning.

Table 2· Correlation matrix of all study variables of interest

	Age	Sex	Single	Neth· born	SRD Bl	Lonely bl	SD bl	RF bl	Suic. bl	Treat· dur·	SD fu	RF fu	Suic. fu	Morta	Divis	Time assess.	Prev. ref.	Change lone.
Gender (0 = female)	·06**	·																
Single (0 = yes)	·53**	-·07**																
NL born (0 = no)	-·05**	·02*	-·06**															
SRD – bl	-·06**	·07**	-·07**	-·11**														
Lonely - bl	-·05**	-·08**	-·08**	-·07**	·47**													
SD – bl	-·04**	-·09**	-·01	-·12**	·56**	·58**												
RF – bl	-·07**	·09**	-·06**	-·09**	·43**	·32**	·54**											
Suicidal id. - BL	-·024**	·05**	-·07**	-·06**	·36**	·39**	·56**	·29**										
Treatment dur.	·03**	-·004	·02*	-·004	·13**	·11**	·15**	·08**	·15**									
SD – fu	-·03**	-·05**	·-·03*	·-10**	·36**	·34**	·57**	·30**	·33**	·22**								
RF – fu	-·05**	·08**	-·03*	-·09**	·32**	·23**	·34**	·46**	·20**	·10**	·65**							
Suicidal id. – FU	-·022	·04**	-·04**	-·04**	·27**	·29**	·37**	·19**	·56**	·21**	·64**	·42**						
Mortality (0 = no)	·07**	·01	·02	·01	·005	·01	·007	-·01	·04**	·04**	·04**	·01	·07**					
Division	-·02*	-	-·03**	-·02*	·12**	·09**	·14**	·08**	.10**	·18**	·11**	·08**	·10**	·008				
Time between assess.	·02	-·01	·008	·01	·13**	·11**	·13**	·07**	·16**	·86**	·11**	·02	·12**	·04**	·14**			
Previous ref	·07**	-·02*	-·04**	·02**	·09**	·07**	·09**	-·02**	·10**	·09**	·11**	·03*	·11**	·04**	·08**	·10**		
Change loneliness	·04**	·02	·009	-·02	-·12**	-·48**	-·17**	-·09**	-·10**	·04**	·35**	·24**	·22**	·02	-·03*	-·02*	·03*	
Change SRS	·03*	·002	·004	-·01	-·45**	-·16**	-·19**	-·15**	-·10**	·06**	·35**	·26**	·23**	·02	-·01	-·01	·03*	·42**

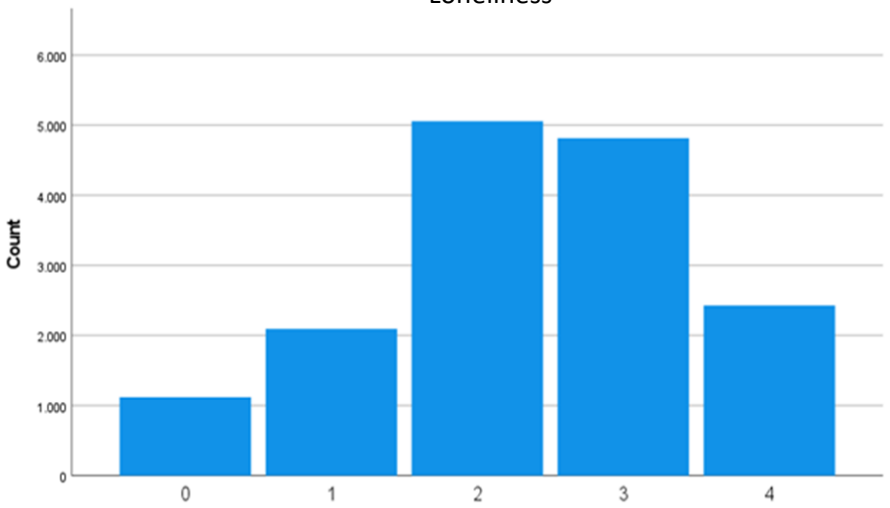
Note. ** significant at p < ·001, p < ·01. Abbreviations. Neth· Born = Netherlands born, SRD = social relationship dissatisfaction, bl = baseline, fu = follow-up, treat· dur· = treatment duration, SD = symptomatic distress, RF = role functioning, Time between assess. = duration between the baseline and follow-up assessment, mortal = mortality, divis = division, prev. ref. = number of previous referrals, lone = loneliness.

Supplementary materials:

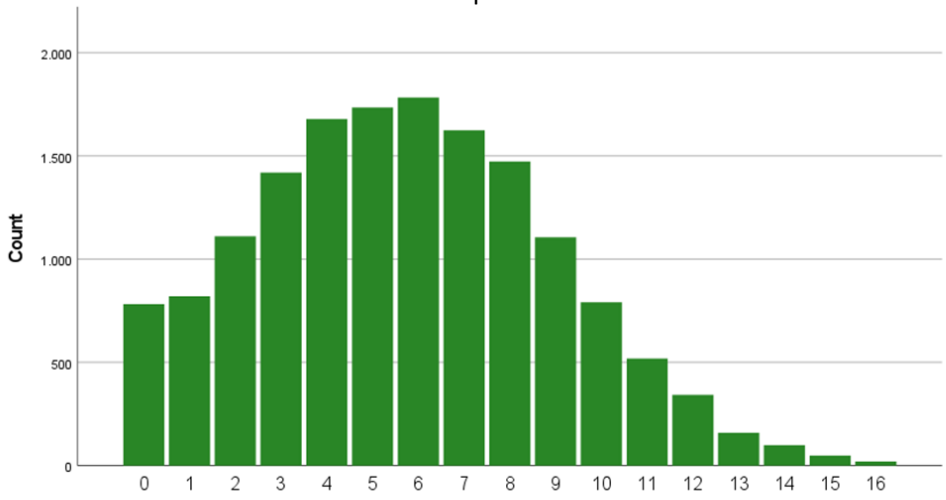
1. **Supplementary figure 1**. Frequency tables of the baseline predictor variables loneliness and SRD
2. **Supplementary figure 2**. Cross-sectional associations between symptomatic distress, loneliness, and SRD by diagnostic category at baseline
3. **Supplementary figure 3**. Cross-sectional associations between symptomatic distress, loneliness, and SRD by age category at baseline
4. **Supplementary figure 4**. Cross-sectional associations between role functioning, loneliness, and SRD by age category at baseline
5. **Supplementary table 1**. Sample characteristics for the sample with baseline assessment only versus the retest (panel) sample
6. **Supplementary table 2**. Sample characteristics by diagnostic group
7. **Supplementary table 3**. Sample characteristics by gender*
8. **Supplementary table 4**. Sample characteristics by age category
9. **Supplementary table 5.** Clinical outcome data for the retest sample by diagnostic group
10. **Supplementary results:** Sensitivity analyses
    - Associations for individuals with versus without a relationship
    - Associations within the oldest help-seeking groups
    - Associations for individuals that were in care during a full COVID-lockdown vs those that were not
11. **Supplementary table** 6. Sample characteristics by age category in the older age-range

Supplementary figure 1

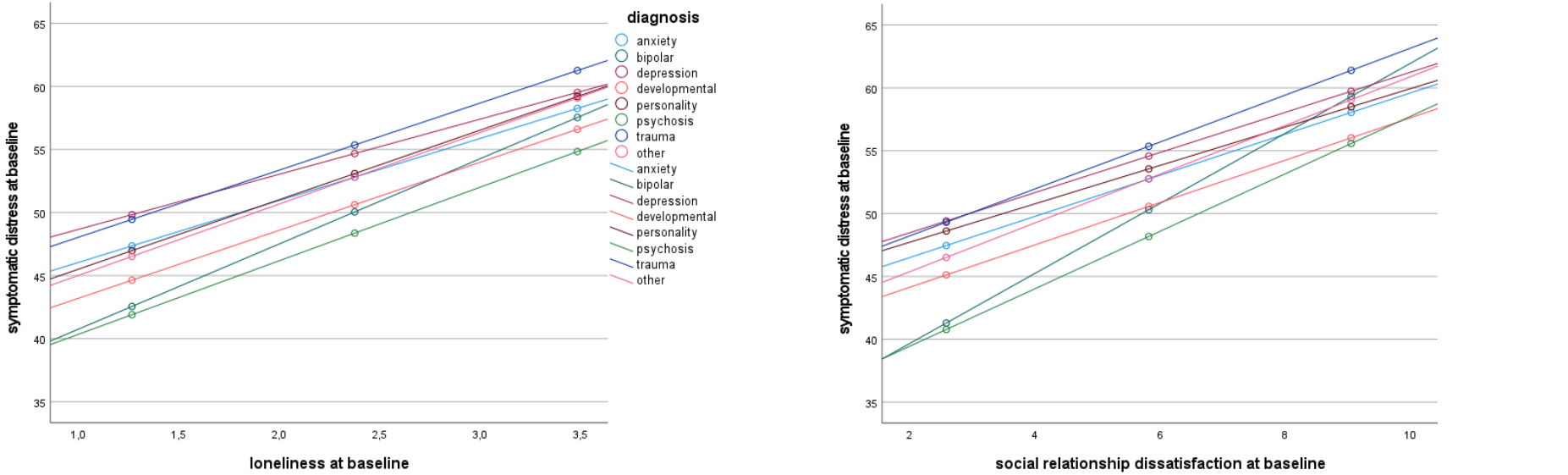
Loneliness



Social relationship dissatisfaction

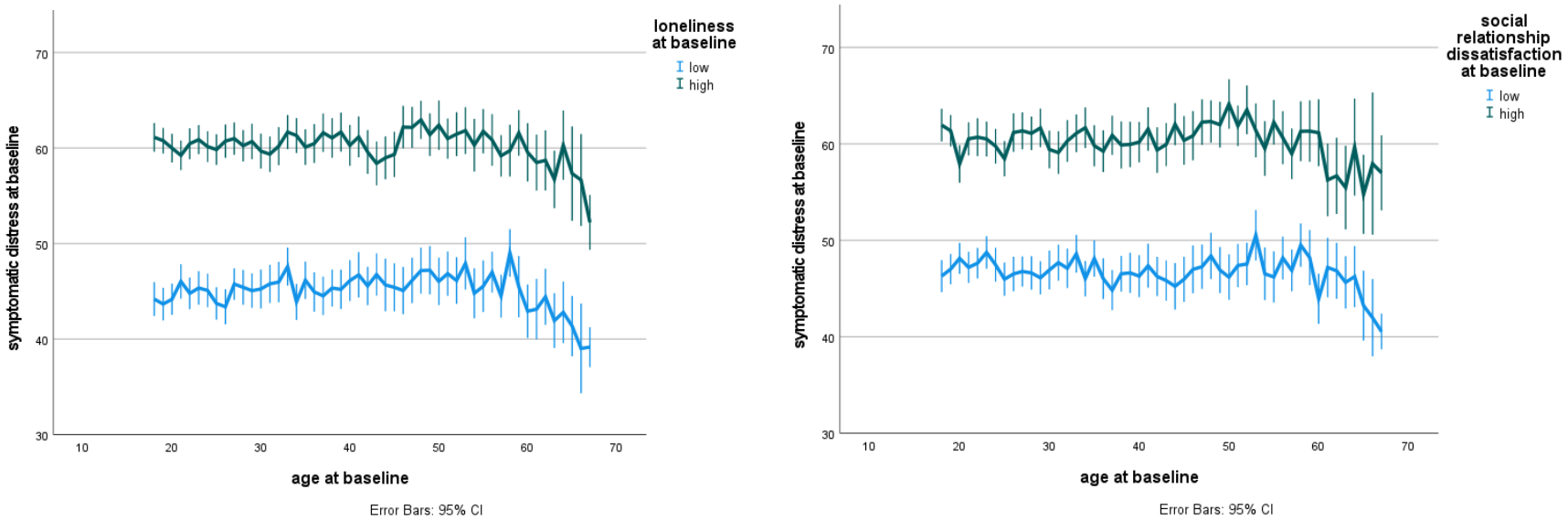


Supplementary figure 2.



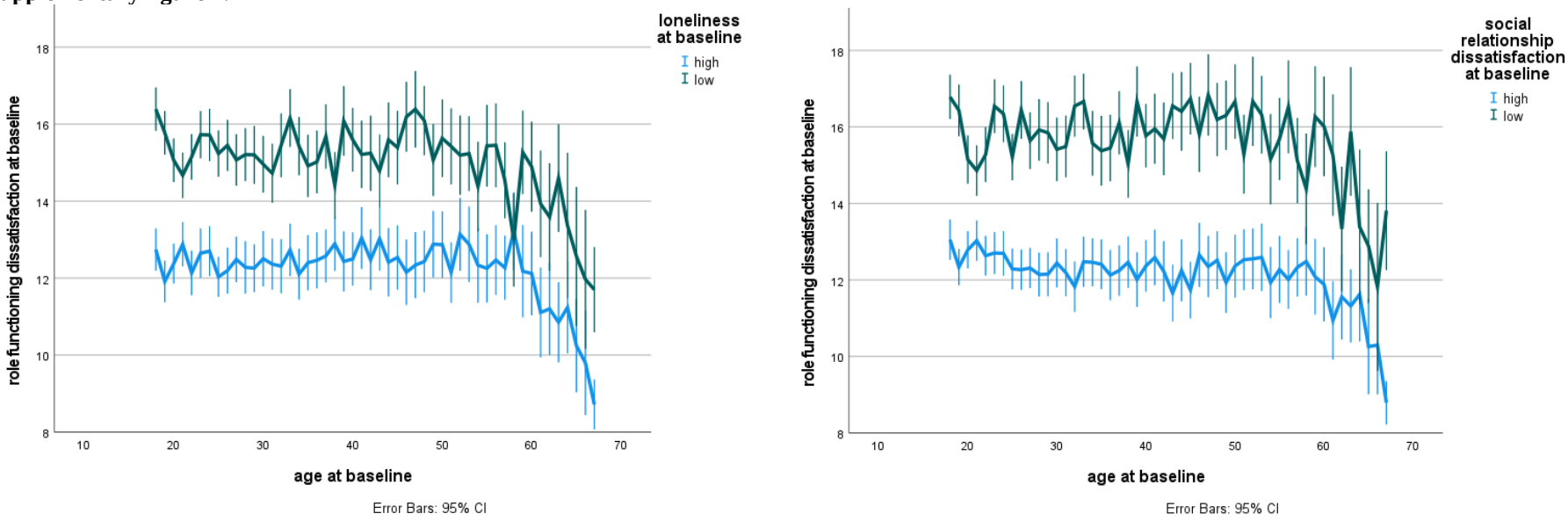
Supplementary figure 2. Cross-sectional associations between symptomatic distress, loneliness, and SRD by diagnostic category at baseline assessment
Note. Visual representation of the analyses are controlled for: age, gender, treatment setting, previous referrals, baseline loneliness or SRD (depending on the independent variable of interest). Diagnosis specific-associations loneliness: bipolar (B = 6·75, CI95% 5·89, 7·61), psychosis (B = 5·83, CI95% 4·75, 6·90), anxiety (B = 4·91, CI95% 4·50, 5·32), depression (B = 4·37, CI95% 4·02, 4·72), developmental (B = 5·39, CI95% 4·95, 5·83), personality (B = 5·51, CI95% 4·84, 6·18), trauma (B = 5·32, CI95% 4·79, 5·85), and other disorders (B = 5·66, CI95% 5·07, 6·25). Diagnosis specific-associations SRD: bipolar (B = 2·79, CI95% 2·49, 3·08), psychosis (B = 2·29, CI95% 1·94, 2·62), anxiety (B = 1·64, CI95% 1·49, 1·78), depression (B = 1·60, CI95% 1·48, 1·71), developmental (B = 1·68, CI95% 1·53, 1·84), personality (B = 1·53, CI95% 1·32, 1·74), trauma (B = 1·87, CI95% 1·69, 2·04), and other disorders (B = 1·94, CI95% 1·74, 2·14).

Supplementary figure 3.



Supplementary figure 3. Cross-sectional associations between symptomatic distress, loneliness, and SRD by age category at baseline
Note. For visual representation loneliness and SRD scores are split at the median.

Supplementary figure 4.



Supplementary figure 4. Cross-sectional associations between role functioning, loneliness, and SRD by age category at baseline
Note. For visual representation loneliness and SRD scores are split at the median.

Supplementary table 1. Sample characteristics for the sample with baseline assessment only versus the retest (panel) sample

Patient characteristics GGZ NHN test-retest sample	Baseline sample N = 9100	Retest sample N = 6412	Statistics
Age (mean, sd)	37·17 (14·08)	37·74 (13·71)	t = 2·42, p = ·013
Gender, female (n, %)	5409 (60·02)	4,051 (63·58)	X^2 = 19·92, p < ·001
Netherlands born[1] (n, %)	7946 (90·59)	5,729 (92·85)	X^2 = 23·82, p < ·001
Single[2] (n, %)	3134 (48·07)	2,095 (44·14)	X^2 = 17·01, p < ·001
Living situation[1] (n, %)			
Alone	2022 (23·86)	1392 (22·88)	X^2 = 40·52, p < ·001
With parent(s)	1534 (18·82)	1046 (17·20)	
With partner (with/ without kids)	3761 (44·38)	2933 (48·22)	
Alone, with kids	733 (8·65)	487 (8·01)	
(Mental health) institute	47 (0·06)	12 (0·20)	
Homeless	26 (0·31)	5 (0·08)	
Other	351 (4·14)	208 (3·42)	
Primary diagnosis[4] (n, %)			
Psychotic disorder	183 (2·59)	119 (1·92)	X^2 = 187·63, p < ·001
Bipolar disorder	173 (2·44)	348 (5·61)	
Depressive/ Dysthymic disorder	1983 (28·02)	1751 (28·21)	
Anxiety disorder	1430 (20·21)	1302 (20·98)	
Neurodevelopmental disorders	1211 (17·11)	902 (14·53)	
Personality disorder	527 (7·47)	680 (10·96)	
Trauma and stress related disorders	857 (12·11)	655 (10·55)	
Other[5]	713 (10·07)	450 (7·25)	
Division[6] *(n, %)*			
Integrated community mental health care	6977 (77·69)	5481 (86·25)	X^2 = 266·43, p < ·001
Acute & forensic mental healthcare	471 (5·24)	67 (1·05)	
Basic mental health care	1533 (17·07)	807 (12·70)	
OQ Loneliness (m, sd)	2·31 (1·12)	2·39 (1·10)	t = 4·68, p < ·001
OQ SRD (m, sd)	5·64 (3·23)	5·83 (3·23)	t = 3·66, p < ·001
OQ RF (m, sd)	13·43 (5·24)	14·01 (5·30)	t = 6·67, p < ·001
OQ SD (m, sd)	51·25 (15·46)	53·72 (15·31)	t = 9·81, p < ·001
OQ suicidal ideation (m, sd)	1·02 (1·12)	1·12 (1·15)	t = 5·66, p < ·001
Mortality (n, %)	68 (0·75)	41 (0·64)	ns
Treatment duration/mths (m, sd)	11·78 (12·95)	28·54 (24·61)	t = 54·41, p < ·0001
Previous GGZ NHN referrals (m, sd, range)	·91 (1·28, 0-14)	·82 (1·20, 0-12)	t = -4·38, p < ·001

Note: [1]data missing on n=571; [2]data missing on n=4246; [3]data missing on n=955; [4] data missing on n=2228·[5]Other diagnoses included (amongst others) psychiatric disorder NOS, undifferentiated somatoform disorder (NOS), non-specified psychiatric disorder, hypochondria, behavioral disorder NOS, alcohol dependence, cannabis dependence; [6]data missing on n=176. Abbreviations. OQ = outcome questionnaire, SRD = social relationship dissatisfaction, SD = symptomatic distress, RF = role functioning.

Supplementary table 2. Sample characteristics by diagnostic group

	Anxiety dx (n = 2,732)	Bipolar dx (n = 521)	Depressive dx (n = 3734)	Developm· dx (n = 2113)	Personality dx (n = 1207)	Psychotic dx (n = 302)	Trauma (n = 1512)	Other (n = 1163)	Statistics
Age (m, sd)	36·83 (14·15)	43·28 (13·12)	39·68 (14·60)	32·12 (11·92)	35·41 (11·99)	37·25 (13·34)	37·36 (13·31)	38·72 (13·63)	F = 84·00, p < ·001
Gender, female (n, %)	1,847 (67·61)	324 (62·19)	2,182 (58·44)	992 (46·95)	888 (74·57)	119 (39·40)	1,105 (73·08)	645 (55·46)	X^2 = 483·26, p < ·001
Netherlands born (n, %)	2,416 (92·82)	487 (93·65)	3,266 (90·27)	1,976 (96·82)	1,122 (93·34)	250 (83·33)	1230 (83·67)	1,028 (92·28)	X^2 = 237·85, p < ·001
Single (n, %)	824 (47·03)	135 (29·67)	1,152 (41·32)	910 (61·95)	520 (50·10)	161 (64·40)	489 (42·56)	329 (39·83)	X^2 = 282·53, p < ·001
Living situation (n, %)									
Alone	519 (20·38)	139 (26·78)	865 (24·41)	435 (21·96)	349 (29·03)	**124 (41·61)**	337 (23·07)	221 (20·24)	X^2 = 651·48, p < ·001
With parent(s)	469 (18·42)	36 (6·94)	576 (16·25)	592 (29·89)	174 (14·48)	65 (21·81)	170 (11·64)	134 (12·27)	
*With partner**	1290 (50·67)	289 (55·68)	1673 (47·21)	751 (37·91)	497 (41·35)	84 (28·19)	655 (44·83)	608 (55·68)	
Alone, with kids	167 (6·56)	42 (8·09)	296 (8·35)	87 (4·39)	132 (10·98)	9 (3·02)	211 (14·44)	86 (7·88)	
(Mental health) institute	1 (0·03)	3 (0·58)	6 (0·17)	19 (0·96)	7 (0·58)	3 (1·01)	8 (0·55)	0	
Homeless	1 (0·03)	0	9 (0·25)	2 (0·10)	3 (0·25)	2 (0·67)	7 (0·48)	2 (0·18)	
Other	99 (3·89)	10 (1·93)	119 (3·36)	95 (4·80)	40 (3·33)	11 (3·69)	73 (5·00)	41 (3·75)	
Division[5] (n, %)									
Integrated community MHC	1977 (72·55)	487 (94·02)	3156 (84·82)	1686 (80·06)	1165 (96·76)	279 (93·00)	1299 (86·14)	896 (77·37)	X^2 = 728·08, p < ·001
Acute & forensic MHC	52 (1·91)	9 (1·74)	134 (3·60)	19 (0·90)	28 (2·33)	20 (6·67)	51 (0·34)	72 (6·22)	
Basic MHC	696 (25·54)	22 (4·25)	431 (11·58)	401 (19·04)	11 (0·91)	1 (0·33)	158 (10·48)	190 (16·41)	
OQ Loneliness (m, sd)	2·11 (1·07)	2·14 (1·14)	2·62 (1·06)	2·19 (1·11)	2·83 (·96)	2·16 (1·20)	2·55 (1·09)	2·03 (1·12)	F = 120·27, p < ·001
OQ SRD (m, sd)	4·83 (3·03)	5·19 (3·30)	6·28 (3·15)	5·89 (3·12)	7·11 (3·06)	5·89 (3·71)	6·18 (3·31)	4·92 (3·22)	F = 97·94, p <001
OQ RF (m, sd)	12·66 (4·93)	12·94 (5·43)	14·69 (5·20)	14·08 (5·01)	14·66 (5·37)	13·21 (5·85)	13·97 (5·64)	13·12 (5·34)	F = 44·96, p < ·001
OQ SD (m, sd)	49·73 (14·45)	47·71 (18·25)	56·52 (13·93)	49·37 (15·16)	58·50 (13·73)	46·86 (17·32)	57·27 (15·09)	48·98 (15·58)	F = 139·04, p < ·001
OQ suicidal ideation (m, sd)	·66 (·91)	1·08 (1·15)	1·45 (1·17)	·91 (1·08)	1·55 (1·20)	·97 (1·10)	1·21 (1·18)	·81 (1·04)	F = 168·97, p < ·001
Mortality (n, %)	10 (·36)	15 (2·88)	45 (1·21)	2 (·09)	14 (1·16)	5 (1·66)	7 (·46)	8 (0·69)	X^2 = 63·10, p < ·001
Treatment duration/mths (m, sd)	14·62 (13·29)	51·64 (37·00)	18·61 (17·68)	21·50 (20·57)	30·29 (24·43)	36·70 (33·33)	19·08 (18·12)	15·35 (16·23)	F = 313·09, p < ·001
Previous GGZ NHN referrals (m, sd, range)	·70 (1·12)	1·17 (1·31)	·75 (1·12)	·91 (1·12)	1·39 (1·55)	1·20 (1·64)	·99 (1·36)	·75 (1·15)	F = 54·16, p < ·001

Note. *With and without kids. Abbreviations. Dx = diagnosis, OQ = outcome questionnaire, SRD = social relationship dissatisfaction, RF = role functioning, SD = symptomatic distress, MHC = mental health care.

Supplementary table 3. Sample characteristics by gender*

	Female (n = 9460)	Male (n = 5924)	Statistics
Age (m, sd)	36·74 (13·91)	38·51 (13·90)	F = 59·53, p < ·001
Netherlands born (n, %)	8365 (91·10)	5310 (92·20)	X^2 = 5·54, p = ·02
Single (n, %)	3030 (43·67)	2199 (50·81)	X^2 = 54·57, p < ·001
Living situation (n, %)			
Alone	1802 (20·14)	1612 (28·73)	X^2 = 430·353, p < ·001
With parent(s)	1491 (16·66)	1089 (19·41)	
With partner (with/ without kids)	4255 (47·56)	2439 (43·48)	
Alone, with kids	1037 (11·59)	183 (3·26)	
(Mental health) institute	31 (·35)	28 (·50)	
Homeless	16 (1·79)	15 (·27)	
Other	315 (3·52)	244 (4·35)	
Primary diagnosis (n, %)			
Psychotic disorder	119 (1·47)	183 (3·53)	X^2 = 483·26, p < ·001
Bipolar disorder	324 (4·00)	197 (3·80)	
Depressive/ Dysthymic disorder	2182 (26·93)	1552 (29·95)	
Anxiety disorder	1847 (22·80)	885 (17·08)	
Neurodevelopmental disorders	992 (12·24)	1121 (21·63)	
Personality disorder	888 (10·96)	319 (6·16)	
Trauma and stress related disorders	1105 (13·64)	407 (7·85)	
Other	645 (7·96)	518 (10·00)	
Division (n, %)			
Integrated community mental health care	7624 (80·85)	4834 (81·85)	X^2 = 19·10, p < ·001
Acute & forensic mental healthcare	296 (3·14)	242 (4·10)	
Basic mental health care	1510 (16·01)	830 (14·05)	
OQ Loneliness (m, sd)	2·41 (1·08)	2·23 (1·16)	F = 93·31, p < ·001
OQ SRD (m, sd)	5·54 (3·16)	6·00 (3·33)	F = 73·39, p < ·001
OQ RF (m, sd)	13·28 (5·19)	14·30 (5·35)	F = 137·62, p < ·001
OQ SD (m, sd)	53·36 (15·05)	50·57 (15·94)	F = 119·43, p < ·001
OQ suicidal ideation (m, sd)	1·02 (1·13)	1·13 (1·14)	F = 39·60, p < ·001
Mortality (n, %)	60 (·63)	49 (·83)	ns
Treatment duration/mths (m, sd)	18·78 (20·32)	18·62 (20·94)	ns
Previous GGZ NHN referrals (m, sd, range)	·89 (1·28)	·84 (1·20)	F = 5·17, p = ·02

Note. *missing n = 128. Abbreviations. OQ = outcome questionnaire, SRD = social relationship dissatisfaction, RF = role functioning, SD = symptomatic distress.

Supplementary table 4. Sample characteristics by age category

	18-25 (n = 3960)	26-35 (n = 3922)	36-45 (n = 2957)	46-55 (n = 2636)	56-66 (n = 1787)	67+ (n = 250)	Statistics
Age (m, sd)	21·39 (2·31)	30·26 (2·89)	40·28 (2·87)	50·33 (2·85)	59·97 (2·98)	71·79 (5·02)	F = 73680, p < ·001
Netherlands born (n, %)	3648 (95·42)	3451 (91·51)	2522 (88·12)	2252 (88·84)	1584 (91·99)	218 (95·61)	X^2 = 146·68, p < ·001
Gender, female (n, %)	2555 (65·26)	2501 (64·19)	1743 (59·29)	1500 (57·47)	1004 (56·63)	157 (62·80)	X^2 = 77·27, p < ·001
Single (n, %)	2439 (87·96)	1429 (52·59)	734 (33·26)	425 (21·07)	194 (13·91)	8 (5·10)	X^2 = 3340·67, p < ·001
Living situation (n, %)							
Alone	582 (15·63)	999 (27·31)	609 (21·80)	600 (24·23)	553 (32·80)	71 (32·13)	X^2 = 6995·35, p < ·001
With parent(s)	2226 (59·80)	305 (8·34)	40 (1·43)	8 (·32)	1 (·04)	0	
With partner (with/ without kids)	582 (15·63)	1907 (52·13)	1618 (57·93)	1435 (57·96)	1008 (59·79)	144 (65·16)	
Alone, with kids	53 (1·42)	287 (7·85)	427 (15·29)	370 (14·94)	83 (4·92)	0	
(Mental health) institute	41 (1·10)	8 (·22)	3 (·11)	6 (·24)	0	1 (·45)	
Homeless	10 (·27)	5 (·14)	8 (·29)	5 (·20)	3 (·18)	0	
Other	229 (6·15)	147 (4·02)	88 (3·15)	52 (2·10)	38 (2·23)	5 (2·26)	
Primary diagnosis (n, %)							
Psychotic disorder	74 (2·18)	78 (2·32)	59 (2·32)	61 (2·67)	28 (1·86)	2 (1·00)	X^2 = 712·85, p < ·001
Bipolar disorder	67 (1·98)	91 (2·71)	114 (4·49)	133 (5·83)	108 (7·18)	8 (4·00)	
Depressive disorder	824 (24·26)	859 (25·56)	623 (24·52)	774 33·93)	580 (38·54)	74 (37·00)	
Anxiety disorder	717 (21·11)	767 (22·82)	503 (19·80)	370 (16·22)	308 (20·47)	67 (33·50)	
Neurodevelopmental disorders	835 (24·59)	531 (15·80)	414 (16·29)	228 (10·00)	97 (6·45)	8 (4·00)	
Personality disorder	313 (9·22)	338 (10·06)	280 (11·02)	204 (8·94)	70 (4·65)	2 (1·00)	
Trauma & stress related	354 (10·42)	408 (12·14)	299 (11·77)	268 (11·75)	168 (11·16)	15 (7·50)	
Other	212 (6·24)	289 (8·60)	249 (9·98)	243 (10·65)	146 (9·70)	24 (12·00)	
Division[5] (n, %)							
Integrated community mental health care	3180 (81·37)	3088 (79·32)	2392 (81·69)	2196 (84·62)	1450 (82·20)	152 (61·29)	X^2 = 144·60, p < ·001
Acute & forensic mental healthcare	85 (2·18)	154 (39·56)	93 (3·18)	98 (3·78)	84 (4·77)	24 (9·68)	
Basic mental health care	643 (16·45)	651 (16·72)	443 (15·13)	301 (11·60)	230 (13·04)	72 (29·03)	
OQ Loneliness (m, sd)	2·42 (1·10)	2·35 (1·09)	2·32 (1·10)	2·35 (1·15)	2·24 (1·15)	2·00 (1·16)	F = 12·17, p < ·001
OQ SRD (m, sd)	5·75 (3·12)	5·80 (3·18)	5·97 (3·31)	5·87 (3·39)	5·15 (3·24)	3·57 (3·22)	F = 39·02, p < ·001
OQ RF (m, sd)	13·94 (4·91)	13·72 (5·17)	13·85 (5·26)	13·92 (5·61)	12·82 (5·56)	9·76 (4·78)	F = 41·42, p < ·001
OQ SD (m, sd)	52·44 (15·22)	52·49 (15·26)	52·31 (15·29)	53·51 (16·05)	50·74 (15·31)	43·70 (14·84)	F = 22·68, p < ·001
OQ suicidal ideation (m, sd)	1·19 (1·18)	·96 (1·11)	·94 (1·08)	1·18 (1·15)	1·08 (1·12)	·74 (1·01)	F = 34·91, p < ·001
Mortality (n, %)	12 (·30)	7 (·18)	14 (·47)	37 (1·40)	34 (1·90)	5 (2·00)	X^2 = 88·21, p < ·001
Treatment duration/mths (m, sd)	17·36 (18·16)	17·91 (19·55)	20·42 (22·89)	20·75 (22·34)	18·55 (21·08)	12·57 (14·87)	F = 18·36, p < ·001
Previous GGZ NHN referrals (m, sd, range)	·70 (1·00)	·85 (1·26)	·96 (1·36)	1·03 (1·43)	·94 (1·21)	·64 (1·12)	F = 29·99, p < ·001

Note. Older age truncated to 67+ due to small numbers. Abbreviations. OQ = outcome questionnaire, SRD = social relationship dissatisfaction, RF = role functioning, SD = symptomatic distress.

Supplementary table 5. Clinical outcome data (last available follow-up) for the retest sample by diagnostic group

	Anxiety dx (n=1432)	**Bipolar dx (n=364)**	**Depressive dx (n=1926)**	**Developmental· dx (n=953)**	**Personality dx (n=715)**	**Psychotic dx (n=130)**	**Trauma dx (n=705)**	**Other dx (n=494)**	**Statistics**
OQ Loneliness (m, sd)	1·61 (1·07)	1·69 (1·15)	2·05 (1·10)	1·85 (1·07)	2·37 (1·09)	1·62 (1·12)	1·99 (1·19)	1·66 (1·16)	F = 44·49, p < ·001
Change in OQ Loneliness between first and last assessment (m, sd)	-·45 (1·04)	-·47 (1·22)	-·55 (1·15)	-·40 (1·07)	-·51 (1·12)	-·52 (1·28)	-·57 (1·17)	-·49 (1·11)	F = 3·44, p = ·001
OQ SRD (m, sd)	3·69 (2·84)	4·13 (3·05)	4·95 (3·22)	3·10 (·10)	6·18 (3·11)	4·15 (3·03)	5·03 (3·44)	3·88 (2·93)	F = 58·90, p < ·001
Change in OQ SRD between first and last assessment	-1·08 (2·43)	-1·11 (3·16)	-1·32 (2·92)	-·91 (2·67)	-1·08 (3·03)	-1·23 (3·03)	-1·15 (3·05)	-·86 (2·47)	F = 2·84, p = ·006
OQ RF (m, sd)	10·02 (4·58)	10·26 (4·92)	11·68 (5·17)	11·79 (4·65)	12·60 (5·13)	9·69 (4·65)	11·59 (5·74)	11·14 (4·75)	F = 27·95, p < ·001
Change in OQ RF between first and last assessment	-2·72 (4·85)	-2·59 (5·70)	-3·14 (5·72)	-2·50 (5·02)	-2·50 (5·84)	-3·01 (5·90)	-2·49 (5·76)	-2·20 (5·24)	F = 2·99, p = ·004
OQ SD (m, sd)	37·54 (16·28)	37·59 (18·00)	43·41 (17·49)	42·42 (16·41)	48·94 (17·06)	34·08 (18·67)	45·03 (19·87)	39·94 (16·65)	F = 43·27, p < ·001
Change in OQ SD between first and last assessment	-12·03 (14·09)	-10·28 (17·49)	-13·65 (16·09)	-9·03 (14·11)	-10·51 (16·14)	-10·22 (15·46)	-12·79 (17·13)	-9·59 (14·00)	F = 11·57, p < ·001
OQ suicidal ideation (m, sd)	·40 (·74)	·69 (·95)	·90 (1·02)	·70 (·93)	1·09 (1·10)	·61 (·93)	·76 (1·03)	·52 (·83)	F = 52·63, p < ·001
Change in OQ suicidal ideation between first and last assessment	-·24 (·80)	-·37 (1·04)	-·56 (1·08)	-·56 (1·07)	-·52 (1·18)	-·34 (1·00)	-·46 (1·07)	-·21 (·83)	F = 18·92, p < ·001

Abbreviations. Dx = diagnosis, SRD = social relationship dissatisfaction, SD = symptomatic distress, RF = role functioning.

Supplementary results.

Sensitivity analyses

Associations for individuals with versus without a relationship

Since individuals who were single reported more SRD (SRD mean = 6·15 (SD = 3·17) vs· SRD mean = 5·72 (SD = 3·27), p < ·001) and more loneliness (mean = 2·49 (SD = 1·10) vs· mean = 2·31 (SD = 1·12), p < ·001) at baseline assessment compared to those with a partner, primary analyses were repeated exploring the interaction while controlling for relationship status. Restricting the analyses to individuals who were single, or instead, to those in a relationship, did not change any of the results.

Associations within the oldest help-seeking groups

Two hundred-fifty clients with at least one assessment (age 67 to 70, n = 127; age 71 to 75, n = 70; age 76+, n = 53) exceeded the Dutch retirement age at the time of referral to GGZ NHN. This age range contained too few individuals to conduct linear analyses by age and were therefore separately analysed by age group, using data from individuals one age-bracket above sixty but below retirement age (aged 62 to 66; n = 566) as reference group (see **Supplementary Table 6**). Findings suggest that as they get older and beyond retirement age GGZ service users experience less loneliness (p = ·001) and SRD (p < ·001) compared with those aged 62 to 66. However, cross-sectional, and longitudinal associations between the two measures of social connectedness and recovery-related outcomes of symptomatic distress and role functioning did not differ between the different groups of older service users and those aged 62 to 66.

COVID-19 analyses

To exclude the possibility that our findings were biased by the unprecedented COVID-19 pandemic, which arguably impacted the possibility of social interactions, mental health care and mental health in general, the main analyses were repeated separately for (1) individuals that were in care at any time during any of the two full regional COVID-19 lockdowns (between March 15 and May 11 2020 & between December 14 and April 28 2021; n = 6264) and (2) individuals that received care at GGZ NHN outside of these periods (n = 6976). While the level of SRD (mean = 5·80, SD = 3·25 vs mean = 5·66, SD = 3·21) and loneliness (mean = 2·37, SD=1·12 vs mean = 2·33, SD =1·12) were on average higher for the group that was in care during the pandemic, associations between SRD, loneliness and clinical outcomes were highly comparable:

Baseline associations:

- *Loneliness & symptomatic distress:* In care during COVID-19 ($F(1, 6249) = 1112{\cdot}63$, $p < {\cdot}001$, $\eta = {\cdot}15$) versus Not in care during COVID-19 ($F(1, 6961) = 1340{\cdot}39$, $p < {\cdot}001$, $\eta = {\cdot}16$).
- *SRD & symptomatic distress:* In care during COVID-19 ($F(1, 6249) = 1221{\cdot}49$, $p < {\cdot}001$, $\eta = {\cdot}16$) versus Not in care during COVID-19 ($F(1, 6961) = 1211{\cdot}39$, $p < {\cdot}001$, $\eta = {\cdot}15$).

- *Loneliness & role functioning:* In care during COVID-19 ($F(1, 6249) = 132{\cdot}53$, $p < {\cdot}001$, $\eta = {\cdot}02$) versus Not in care during COVID-19 ($F(1, 6961) = 208{\cdot}49$, $p < {\cdot}001$, $\eta = {\cdot}03$).
- *SRD & role functioning:* In care during COVID-19 ($F(1, 6249) = 723{\cdot}81$, $p < {\cdot}001$, $\eta = {\cdot}10$) versus Not in care during COVID-19 ($F(1, 6961) = 741{\cdot}29$, $p < {\cdot}001$, $\eta = {\cdot}10$).

Follow-up associations:

- **Loneliness & symptomatic distress:** In care during COVID-19 ($F(1, 4006) = 272{\cdot}99$, $p < {\cdot}001$, $\eta = {\cdot}15$) versus Not in care during COVID-19 ($F(1, 2657) = 173{\cdot}53$, $p < {\cdot}001$, $\eta = {\cdot}07$).
- **SRD & symptomatic distress:** In care during COVID-19 ($F(1, 4006) = 304{\cdot}85$, $p < {\cdot}001$, $\eta = {\cdot}07$) versus Not in care during COVID-19 ($F(1, 2657) = 245{\cdot}04$, $p < {\cdot}001$, $\eta = 08$).
- **Loneliness & role functioning:** In care during COVID-19 ($F(1, 4006) = 75{\cdot}71$, $p < {\cdot}001$, $\eta = {\cdot}02$) versus Not in care during COVID-19 ($F(1, 2657) = 46{\cdot}67$, $p < {\cdot}001$, $\eta = {\cdot}02$).
- **SRD & role functioning:** In care during COVID-19 ($F(1, 4006) = 278{\cdot}13$, $p < {\cdot}02$, $\eta = {\cdot}07$) versus Not in care during COVID-19 ($F(1, 2657) = 184{\cdot}84$, $p < {\cdot}001$, $\eta = {\cdot}07$).
- **Loneliness & treatment duration:** In care during COVID-19 (B = -·08, SE = ·03, Wald = 9·48, p = ·002, OR = 1·08 (CI95% 1·03-1·09)) versus Not in care during COVID-19 (B = -·08, SE = ·03, Wald = 7·53, p = ·006, OR = 1·08 (CI95% 1·02-1·13).
- **SRD & treatment duration:** In care during COVID-19 (B = -·08, SE = ·009, Wald = 71·31, p < ·001, OR = 1·08 (CI95% 1·06-1·09) versus Not in care during COVID-19 (B = -·04, SE = ·01, Wald = 11·01, p < ·001, OR = 1·03 (CI95% 1·01-1·05)).

Supplementary table 6. Sample characteristics by age category in the older age-range

	62-66 (n = 566)	67-70 (n = 127)	71-75 (n = 70)	76+ (n = 53)	Statistics
Age (m, sd)	63·68 (1·34)	67·91 (·98)	72·97 (1·43)	79·53 (4·01)	F = 2117·82, p < ·001
Netherlands born (n, %)	521 (95·25)	110 (93·22)	60 (96·77)	48 (100)	ns
Gender, female (n, %)	321 (57·02)	72 (56·67)	45 (64·29)	40 (75·47)	X^2 = 7·92, p < ·001
Single (n, %)	63 (14·00)	5 (5·75)	0	3 (11·54)	X^2 = 11·12, p < ·001
Living situation (n, %)					
Alone	189 (35·80)	38 (32·48)	15 (23·81))	18 (43·90)	Ns
With parent(s)	0	0	0	0	
With partner (with/ without kids)	319 (60·42)	77 (65·81)	46 (73·02)	21 (51·22)	
Alone, with kids	5 (·95)	0	0	0	
(Mental health) institute	0	1 (·85)	0	0	
Homeless	0	0	0	0	
Other	15 (2·84)	1 (·85)	2 (3·17)	2 (4·88)	
Primary diagnosis (n, %)					
Psychotic disorder	12 (2·56)	1 (·97)	0	1 (2·33)	X^2 = 37·10, p = ·02
Bipolar disorder	30 (6·41)	7 (6·80)	1 (1·85)	0	
Depressive/ Dysthymic disorder	202 (43·16)	39 (37·86)	12 (22·22)	23 (53·49)	
Anxiety disorder	102 (21·79)	30 (29·13)	22 (40·74)	15 (34·88)	
Neurodevelopmental disorders	19 (40·60)	6 (5·83)	2 (3·70)	0	
Personality disorder	15 (3·21)	2 (1·94)	0	0	
Trauma & stress related	40 (8·55)	8 (7·77)	6 (11·11)	1 (2·33)	
Other	48 (10·26)	10 (9·71)	11 (20·37)	3 (6·98)	
Division[5] (n, %)					
Integrated community mental health	450 (80·79)	91 72·22)	39 (55·71)	22 (42·31)	X^2 = 57·89, p < ·001
care	40 (7·18)	8 (6·35)	8 (11·43)	8 (15·38)	
Acute & forensic mental healthcare	67 (12·03)	27 (21·43)	23 (32·86)	22 (42·31)	
Basic mental health care					
OQ Loneliness (m, sd)	2·17 (1·16)	2·03 (1·13)	1·94 (1·13)	1·98 (1·28)	Ns
OQ SRD (m, sd)	4·65 (3·19)	4·20 (3·50)	2·86 (2·60)	3·02 (·41)	F = 9·99, p < ·001
OQ RF (m, sd)	11·83 (5·33)	10·21 (5·08)	9·60 (4·60)	8·87 (4·17)	F = 10·19, p < ·001
OQ SD (m, sd)	48·49 (15·09)	45·39 (15·51)	43·84 (13·95)	39·49 (13·70)	F = 7·83, p < ·001
OQ suicidal ideation (m, sd)	·94 (1·09)	· 80 (1·09)	·61 (·86)	·77 (1·01)	Ns
Mortality (n, %)	17 (3·00)	2 (1·57)	1 (1·43)	2 (3·77)	Ns
Treatment duration in mths (m, sd)	16·41 (19·07)	12·91 (13·86)	14·51 (19·21)	9·19 (9·32)	F = 3·59, p = ·013
Previous GGZ NHN referrals (m, sd, range)	·91 (1·28)	·89 (1·36)	·39 (·77)	·40 (·69)	F = 6·27, p < ·001

Note. Reference category is shaded in grey. Abbreviations. NS = not significant, OQ = outcome questionnaire, SRD = social relationship dissatisfaction, RF = role functioning, SD = symptomatic distress.