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Behavioral Problems and Depressive Symptoms in Adolescents with Type 1 Diabetes Mellitus: Self and Parent Reports

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1. Introduction

Children and adolescents with chronic diseases are at higher risk for mental health problems. Especially in adolescence, which involves a multitude of physical, cognitive and emotional developmental changes, a chronic disease such as diabetes mellitus type 1 (T1DM) that requires daily, careful attention, may influence social and emotional functioning. Adolescents with T1DM must deal with disease-specific stressors, in addition to age-specific stressors (Reid, Dubow, Carey, & Dura, 1994). Stress, in itself, may dysregulate diabetes through psycho-physiological processes or associated changes in self-management behaviors (Snoek, 2000). Therefore, diabetic treatment guidelines include metabolic goals, as well as facilitation of normal social and emotional development (Grey & Boland, 1996). Problems in social-emotional functioning are reflected in the occurrence of internalizing or externalizing behavior problems. Diabetes has been found to form a risk factor for psychiatric disorders in adolescence, especially for internalizing behavior problems like depression Kovacs, Obrosky, Goldston & Drash, 1997; Northam, Matthews, Anderson, Cameron & Werther, 2005). Several studies have found that diabetes and depression frequently co-occur in adolescence Anderson, Freedland, Clouse & Lustman, 2001; Lin et al., 2004; Hood et al., 2006; Lawrence et al., 2006; McGrady & Hood, 2010, although this is not always the case (DeWit, 2007).

Externalizing problems may also be important among adolescents with T1DM. Externalizing behavior problems have been found to result in poorer glycemic control (Cohen, Lumley, Naar-King, Partridge & Cakan, 2004), and diagnoses of pre-existing externalizing behavior problems were associated with poorly controlled diabetes and externalizing behaviors in adolescence (Northam et al., 2005).

The kind of mental health problems experienced by adolescents with T1DM needs to be clarified, in order to improve guidelines for treatment of diabetes. To this end, researchers should rely upon both adolescent-reported measures that might be applied in regular care, as well as parent-reported measures. Comparing answers of these youths to those from healthy peers can indicate the extent to which differences exist between these groups.

We studied whether Dutch adolescents with T1DM had increased levels of behavior problems in comparison to peers without T1DM, both according to their self-reports and reports from their mothers and fathers. We studied depressive symptoms, and detailed clusters of behavioral problems. Additionally, we examined the extent to which metabolic control is related to depressive symptoms and specific behavior problems.

2. Design and methods

2.1. Sample

Patients with T1DM between 12 and 18 years of age (n=302) and their parents were recruited for participation. They were treated by a multidisciplinary team at nine hospitals in The Netherlands. A total of 151 adolescents agreed to participate, as did their parents. Informed consent was obtained from 135 mothers and 114 fathers (see table 1). Medical information (most recent HbA1c, duration of the disease, and treatment regimen) was recorded from the hospital charts. HbA1c was analyzed with similar assays, using gas chromatography, in the different hospitals.

Schools were approached for cooperation in the same time period in order to recruit the comparison group. Healthy adolescents without T1DM and their parents were invited to participate, matching school type, age, and gender to that of the adolescents with T1DM. The comparison group comprised 122 adolescents without T1DM; In formation was also collected from 114 of these mothers and 61 of the fathers. Exclusion criteria for both groups were no participation of a parent, and comorbid medical or psychiatric illness of the adolescent. All participants in both groups were of Northern European ethnicity.

2.2. Measures

2.2.1. The children's depression inventory

The Children's Depression Inventory (CDI) was developed to measure self-reported depressive symptoms in children and adolescents aged 7 to 17 years (Kovacs, 1992). The inventory assesses a variety of self-reported depressive symptoms, including disturbance in mood, self-evaluation, and interpersonal behaviors. The overall scale gives an indication for the extent of depressive feelings, with a mean (sd) of 7.69 (4.9) for boys and 10.46 (6.5) for girls. Higher scores reflect more depressive feelings. A cutoff score of 13 was used to indicate a serious level of depressive complaints, at risk for a clinical

depression (Kovacs, 1992). Psychometric characteristics are sufficient (Evers, Vliet-Mulder & Groot, 2000).

2.2.2. The child behavior checklist (CBCL) and youth self-report (YSR)

The presence of behavior problems was studied using information from different sources, namely the adolescent themselves (YSR), and their mothers (CBCL) and fathers (CBCL). The Child Behavior Checklist (CBCL) measures behavior problems and competencies of children and adolescents between the ages of 6 to 18, as reported by their parents (Achenbach & Rescorla, 2001). The Youth Self-Report (YSR) is a self-report derivative of the CBCL for adolescents between 11 and 18 years. A detailed clustering of behavior problems is provided in the syndrome scale, which consist of anxious/depressed behaviors, withdrawn/depressed behaviors, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, and aggressive behavior. The CBCL and YSR questionnaires have been shown to have adequate reliability and validity (Evers et al., 2000).

2.3. Procedure

The adolescents with T1DM answered the questionnaires when they visited the diabetes team, or at home. The parents were sent questionnaires by mail. For the control group, the questionnaires were sent to the adolescents and their parents at home. The study was approved by the medical ethical committees of the Catharina hospital in Eindhoven and all participating hospitals.

According to protocol, adolescents who answered in the positive to the critical item on the CDI concerning suicidality, or who scored above the clinical range for depression on both YSR and CDI, were approached to verify whether they received psychological treatment and to offer it when necessary.

2.4. Data analyses

Potential differences in group characteristics were analyzed using chi-square or t-tests. Group differences were examined using multivariate and univariate analyses of variances. All tests were two-sided. Within the T1DM group, a regression analysis was conducted to study the relationship between HbA1c and the depressive symptoms and behavior syndrome scales.

3. Results

3.1. Group characteristics

A description of baseline group characteristics can be found in table 1. The total group of adolescents with T1DM did not differ from the comparison group in age, gender, or education level, as expected in light of the matching procedure.

Variable	Controls (n=122)	T1DM (n=151)
Age :mean (SD)	14.62 (1.66)	14.89 (1.71)
Range	12-18	12-18
Gender		
male	50 (41%)	65 (43%)
female	72 (59%)	86 (57%)
School level		
lower	51 (41.8%)	42 (27.8%)
vocational	12 (9.8%)	19 (12.6%)
higher	27 (22.1%)	46 (30.5%)
pre-university	32 (26.2%)	40 (26.5%)
unknown		4 (2.6%)
Treatment		
Injections		71 (47%)
Pump		80 (53%)
HbA1c: mean (SD)		8.3 (1.46)
Range		5.1-13.0
Age at diagnose: mean (SD)		9.43 (3.82)
range		0-18
Years T1DM: mean (SD)		5.74 (3.92)
range		0-15

*Group differences are not significant

Table 1. Baseline group characteristics*.

3.2. Depressive symptoms

The adolescents with T1DM (mean=7.32, sd=5.32) did not differ from the comparison group (mean=6.55, sd=5.94) in number of depressive complaints according to the CDI ($F_{(1,265)}$=1.100, p=0.295). In the group with T1DM, 18 adolescents (12.4% of a total 145 with complete data) were identified as being at risk for a clinical depression, as were18 adolescents in the control group (14,8% of in total 122 with complete data). These proportions did not not differ (χ^2 (1, N =270) =0.197, p = 0.66), see figure 1.
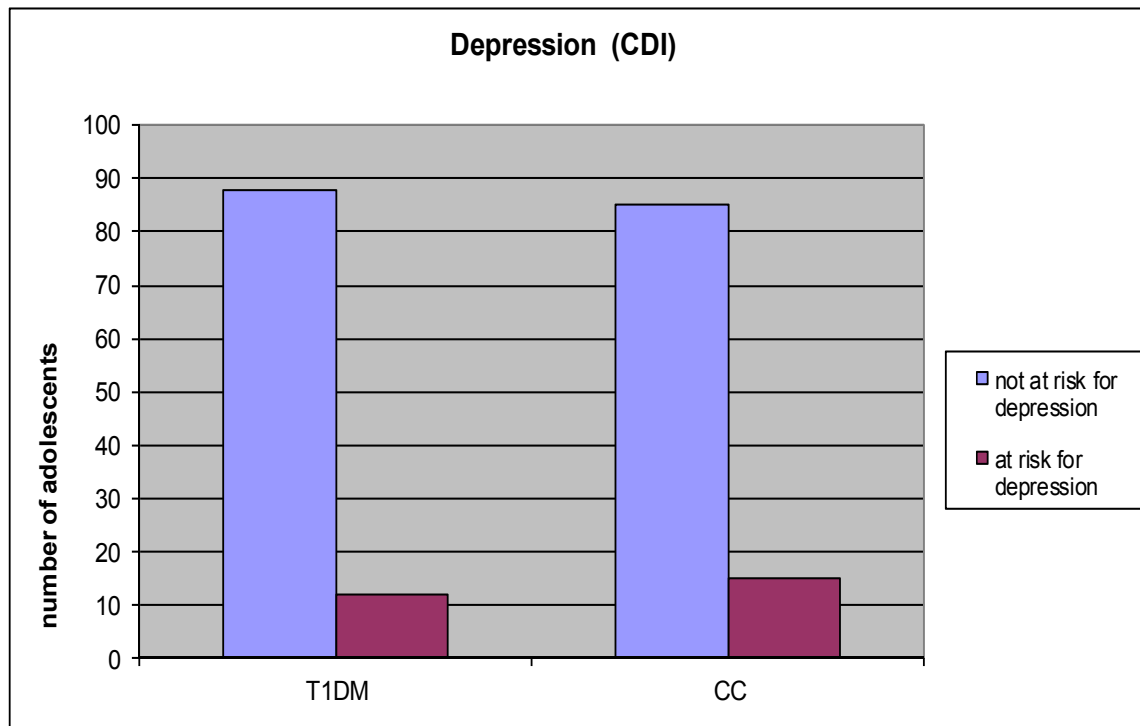
Figure 1. Depression in adolescents with and without T1DM

3.3. Behavior problems

Means and standard deviations for the YSR (as assessed by the adolescents) are presented in table 2, as are CBCL behavioral syndromes (as assessed by mothers and fathers). This table also indicates significant differences found with univariate analyses of variance. Mean factor scores (internalizing, externalizing, and total behavior problems,) and mean scores for the behavioral syndrome scales for adolescents with and without T1Dm, are presented in figures 2 and 3.

For adolescents' self reports on the YSR for the behavioral syndromes, a multivariate analysis of variance showed a significant overall difference (F(8,239)=2.37, p=0.018). One behavioral syndrome scale differed significantly between the groups, reflecting Thought problems, (F(1,247)=11,63, p=0.001), see table 2. The adolescents with T1DM reported more problems than the comparison group on this subscale, which refers to questions such as: 'can't get my mind off certain thoughts'; 'have twitches'; 'have sleeping problems'. Adolescents with T1DM also reported more Thought problems in the borderline and clinical range (n=27) than did the comparison group (n=4) (χ^2 (2)= 14.450, p=.001).

The difficulties concerning Thought problems were corroborated by the CBCL reports from mothers, which showed a significant difference on this syndrome scale (F(1,231)=6.64, p=0.01). The fathers' CBCL reports also showed a significant difference for Thought problems (F(1,155)=4.37, p=0.04). Overall, however, mothers of adolescents with T1DM did not differ significantly from mothers of healthy peers in their CBCL reports concerning behavioral syndromes (F(8,223)=1.80, p=0.08), nor did the fathers (F(8,147)=1.27, p=0.26).

CBCL/YSR	Adolescents		Mothers		Fathers	
	Controls N=111	T1DM N=140	Controls N= 104	T1DM N=128	Controls N=59	T1DM N=99
anxious/ depressed	53.11 (5.50)	53.37 (9.03)	52.55 (4.61)	53.78 (7.27)	52.12 (4.12)	52.91 (8.04)
withdrawn/ depressed	53.15 (5.61)	54.84 (8.34)	53.76 (4.97)	55.58 (7.40)	52.90 (4.39)	54.52 (9.31)
somatic complaints	54.60 (5.86)	56.04 (7.59)	54.76 (5.52)	56.72 (7.53)*	53.37 (4.29)	55.18 (6.48)
social problems	54.21 (5.89)	54.37 (6.62)	53.37 (5.16)	53.22 (7.57)	53.22 (5.09)	53.61 (6.15)
thought problems	52.86 (4.47)	55.74 (8.13)**	52.76 (4.34)	54.81 (7.10)*	52.08 (3.55)	54.01 (6.79)*
attention problems	54.01 (4.98)	54.83 (6.32)	53.46 (4.23)	54.12 (5.88)	52.97 (4.08)	53.79 (5.06)
rule-breaking behav.	53.98 (4.49)	54.65 (6.65)	52.24 (4.04)	52.61 (4.79)	51.59 (3.24)	53.41 (5.18)*
aggressive behavior	52.21 (3.61)	52.87 (5.54)	52.21 (3.96)	52.94 (8.26)	51.83 (4.12)	53.11 (5.51)

Univariate analyses: * $p< 0.05$; ** $p< 0.01$

Table 2. Means and standard deviations for YSR (adolescents) and CBCL (mothers and fathers)
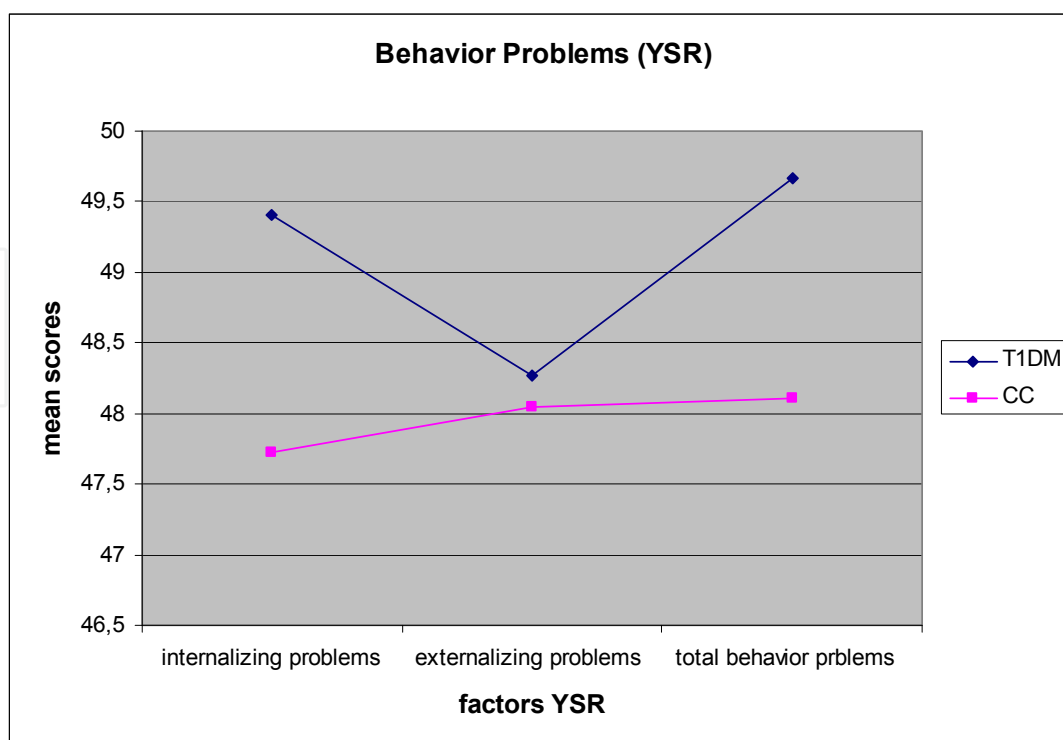

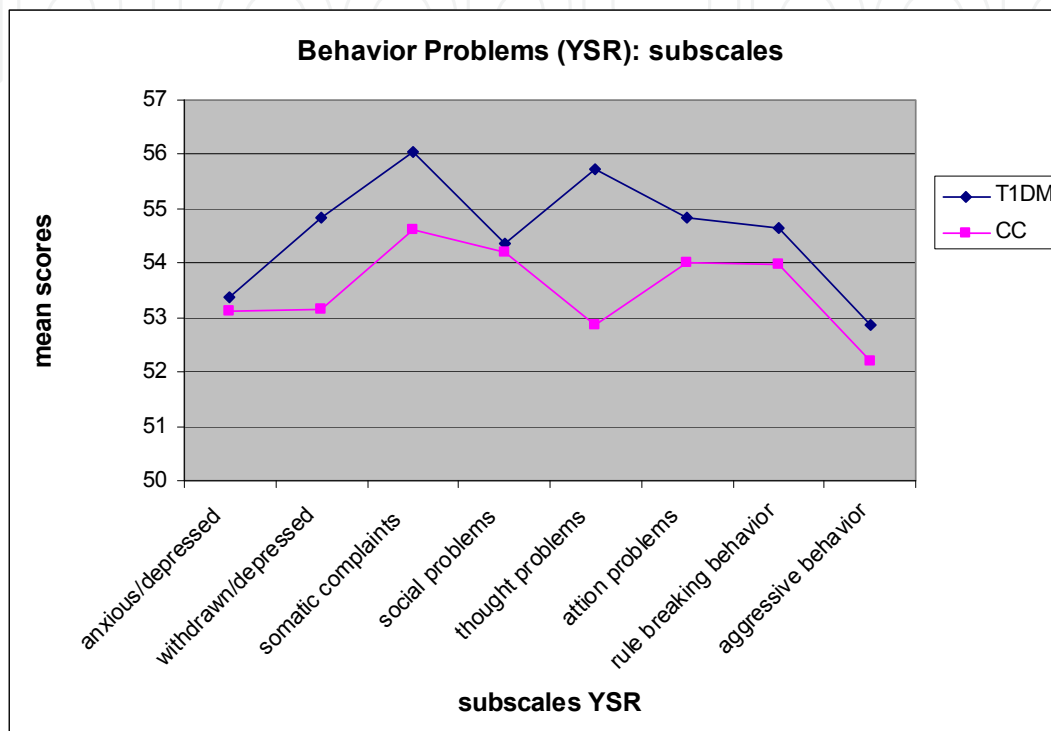**Figure 2.** Behavioral problems in adolescents with and without diabetes (YSR)

Figure 3. Specific behavioral problems in adolescents with and without diabetes (subscales YSR)

3.4. Glycemic control and social emotional functioning

A regression analysis, using the enter procedure, was conducted in order to study the relationship between glycemic control and social-emotional functioning of adolescents with T1DM, as represented by their CDI score and the scores on the eight behavioral syndromes of the YSR (see table 3). This model was significant (F(9,121)=2.17 p=.029), explaining 14% of the variance in the HbA1c levels. Children with more depressive symptoms and rule breaking behavior were found to have higher HbA1c levels.

	B	**p**
anxious/depressed	.086	.554
withdrawn/depressed	-.092	.587
somatic complaints	.214	.120
social problems	-.281	.052
thought problems	-.252	.071
attention problems	-.021	.883
rule-breaking behavior	.392	.013
CDI	.301	.009
R^2	14%	
R^2 change	14%	
F	(9,121)=2.17	.029

Table 3. Relationships between depressive symptoms, behavior problems and HbA1c

4. Discussion

Our study on the types and extent of social-emotional problems among adolescents with T1DM revealed that emotional and behavior problems are related to glycemic control. Blood glucose regulation was found to be related specifically to depressive symptoms and rule breaking behavior among the adolescents with T1DM. The adolescents with poor blood glucose regulation experienced difficulties, in general, as well as problems followng rules; This likely also extends to difficulties in following the rules of their treatment for diabetes. The problems adolescents with T1DM experienced in social emotional functioning could be specifically related to diabetes and diabetes management tasks. The questionnaires used in this study were not diabetes-specific, however, so we cannot indicate diabetes-specific burdens yet.

We also found a remarkable difference, in that the adolescents with DM1 reported more thought problems than the comparison group. The results of our comparison group were in the same range as those of the original norm group of the YSR (Achenbach & Rescorla, 2001). The reports of both mothers and fathers did not show an overall significant difference, but looking univariately at the dimension, a difference in thought problems also appeared in mothers' and fathers' reports of youths' functioning, with parents of adolescents with T1DM reporting more thought problems than the parents of healthy adolescents. The fact that mothers and fathers of youths with T1DM agreed with their children regarding the higher prevalence of Thought problems may underline the importance of these kinds of behavioral difficulties. This result is not easy to interpret, however. Thought problems refer to a variety of problems in learning behavior and information processing. These adolescents more often ruminate on certain thoughts, and have twitches, strange thoughts, or sleeping problems. An explanation for such group differences may be found in subtle neuropsychological effects of diabetes. Both hypo- and hyperglycemia affect cognitive functioning, but in different ways (Periantie et al., 2006). In a

recent meta-analysis, Naguib and colleagues (Naguib, Kulinskaya, Lomax & Garralda, 2009) found mild cognitive impairments in adolescents with T1DM, especially poorer visuospatial ability, motor speed, writing, and sustained attention. This was independent of a history of hypoglycemic episodes. The relationship between thought problems and blood glucose regulation was only marginally significant in our study. It is conceivable, however, that the fluctuating blood glucose levels that all patients with diabetes experience, and the high blood glucose regulation in our group (mean 8.3%), may influence thinking and perception. Our findings are also in line with Nardi (Nardi et al., 2008), who found more thought problems among adolescents in the age of 14 to 18 with T1DM, relative to a comparison group.

Another important finding is a lack of group differences in other syndromes. Further, although depressive symptoms are often associated with T1DM, we found that the incidence of depressive symptoms among adolescents with T1DM was similar to that of adolescents without T1DM. This corroborates findings of the SEARCH study (Lawrence et al., 2006). Our findings indicate that one in eight youths with T1DM met the clinical cut off for depression. This level of depressive symptoms is comparable with the results of Hood (Hood et al., 2006), who reported that one in seven adolescents with T1DM met the same criteria for depression as used in our study. Hood, however, concluded that this level nearly doubles that of the highest estimate of depression among youths in general, but this was based on prior reports and not in comparison with a control group (Fleming, Boyle & Offord, 1993; Anderson & McGee, 2006).

4.1. Clinical implications

In view of the elevated thought problems, and the important associations that blood glucose regulation held with both depressive symptoms and rule breaking behaviors, routine screening for behavioral problems in adolescents with T1DM is recommended.

Increased attention should be devoted to the large group of adolescents who have poor metabolic control. Although strict diabetic treatment management is necessary to maintain adequate levels of HbA1c, this may indicate greater interference with daily life. Adolescents need to be stimulated by their parents and health care professionals to find intrinsic motivation for their own disease management, and to maintain their mental health. Thought problems may need special consideration, and it seems useful to investigate whether and how these problems interfere with diabetes management and daily living. To optimize glycemic levels, specific attention should be paid to adolescents reporting depressive symptoms or rule breaking behavior, in general, because they may experience the most adaptation problems when it comes to treatment rules.

4.2. Strengths, limitations, and future directions

A strength of our study is that we examined a relatively large group of 151 adolescents with T1DM. Many eligible patients refused to participate, however. Although a participation rate

of 50% is comparable to other studies (Lawrence et al., 2006; Lin et al., 2004; De Wit et al., 2007), our research may have been biased in that our results reflect data of relatively well functioning adolescents. The self-selection evolving from voluntary participation may have led to an underestimation of the number of adolescents with depressive symptoms in the group with T1DM. Nevertheless, the group differences found in a behavioral syndrome like thought problems need further study, as it may be important to consider for treatment improvements.

5. Conclusion

One in eight Dutch youths with T1DM met the clinical cut off for depression. The adolescents with T1DM did not differ from healthy peers in their number of depressive complaints. However, the combination of depressive symptoms and rule breaking behavior was related to metabolic control. Further, elevated thought problems were found among adolescents with T1DM, in comparison to healthy peers. This finding warrants further attention in research, as well as in clinical practice.

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6. References

Achenbach, T.M., & Rescorla, L.A. (2001). *Manual for the ASEBA school-age forms profiles.* University of Vermont: Research Center for Children, Youth and Families: Burlington.

Anderson, R.J., Freedland, K.E., Clouse, R.E., & Lustman, P.J. (2001). The prevalence of comorbid depression in adults with diabetes. *Diabetes Care,* 24, 1069-1078.

Anderson, J., & McGee, R. (2006). Comorbidity of depression in children and adolescents. In: Reynolds WM, Johnson HF (ed.) *Handbook of depression in Children and Adolescents.* New York: Plenum, 581-601.

Cohen, D.M., Lumley, M.A., Naar-King, S., Partridge, T., & Cakan, N. (2004). Child behavior problems and family functioning as predictors of adherence and glycemic control in economically disadvantaged children with type 1 diabetes: a prospective study. *Journal of Pediatric Psychology,* 29, 171-184.

De Wit, M., Delemarre-van de Waal, H.A., Bokma, J.A., Haasnoot, K., Houdijk, M.C., Gemke, R.J., & Snoek, F.J. (2007). Self-report and parent-report of physical and psychosocial well-being in Dutch adolescents with type 1 diabetes in relation to glycemic control. *Health and Quality of Life Outcomes,* 16, 5-10.

Evers, A., Vliet-Mulder, J.C., & Groot, C.J. (2000) *Documentatie van tests en testresearch in Nederland*. Boom.

Fleming, J.F., Boyle, M.H., & Offord, D.R. (1993). The outcome of adolescent depression in the Ontario Child Health Study follow-up. *Journal of the American Academy of Child Psychiatry, 32,* 28-33.

Grey, M., & Boland, E.A. (1996). Diabetes Mellitus (Type I). In: Jackson PL (ed.) *Primary Care of the Child with a Chronic Condition*. St. Louis: C.V, Mosby, 350-370.

Hood, K.K., Huestis, S.H., Maher, A., Butler, D., Volkening, L., & Laffel, L.M. (2006). Depressive symptoms in children and adolescents with type 1 diabetes. *Diabetes Care, 29,* 1389-1391.

Kovacs, M. (1992). *The Childrens Depression Inventory (CDI)*. Multi-Health Systems, New York.

Kovacs, M., Obrosky, D.S., Goldston, D., & Drash, A. (1997). Major depressive disorder in youth with IDDM: a controlled prospective study of course and outcome. *Diabetes Care, 20,* 45-51.

Lawrence, J.M., Standiford, D.A., Loots, B., Klingensmith, G.J., Williams, D.E., Ruggiero, A., Liese, A.D., Bell, R.A., Waitzfelder, B.E., & McKeown, R.E. (2006). Prevalence and correlates of depressed mood among youth with diabetes: the SEARCH for Diabetes in Youth study. *Pediatrics, 117,*1348-1358.

Lin, E.H.B., Katon, W., Von Korff, M., Rutter, C., Simon, G.E., Oliver, M., Ciechanowski, P., Ludman, E.J., Bush, T., & Young, B. (2004). Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care, 27,* 2154-2160.

McGrady, M.E., & Hood, K.K. (2010) Depressive symptoms in adolescents with type 1 diabetes: associations with longitudinal outcomes. *Diabetes Research and.Clinical Practice, 88,* e35-e37.

Naguib, J.M., Kulinskaya, E., Lomax, C.L., & Garralda, M.E. (2009). Neuro-cognitive performance in children with type 1 diabetes--a meta-analysis. *Journal of Pediatric Psychology, 34,* 271-282.

Nardi, L., Zucchinni, S., Dálberton, F., Salardi, S., Maltoni, G., Bisacchi, N., Elleri, D., & Cicognani, A. (2008). Quality of life, psychological adjustment and metabolic control in youth with type 1 diabetes : a study with self- and parent-report questionnaires. *Pediatric Diabetes, 9,* 496-503.

Northam, E.A., Matthews, L.K., Anderson, P.J., Cameron, F.J., & Werther, G.A. (2005). Psychiatric comorbidity and health outcome in type 1 diabetes; perspectives from a prospective longitudinal study. *Diabetic Medicine, 22,* 152-157.

Periantie, D.C., Lim, A., Wu, J., Weaver,,P., Warren, S.L., Sadler, M., White, N.H., & Hershey, T. (2008). Effects of prior hypoglycemia and hyperglycemia on cognition in children with type 1 diabetes mellitus. *Pediatric Diabetes, 9,* 87-95.

Reid, G.J., Dubow, E.F., Carey, T.C., & Dura, J.R. (1994). Contribution of coping to medical adjustment and treatment responsibility among children and adolescents with diabetes. *Journal of Developmental and Behavioral Pediatrics*, 15, 327-325.

Snoek, F.J. (2000). *Psychosociale zorg aan mensen met diabetes*. Nederlandse Diabetes Federatie: Leusden.