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Grano, Niklas

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Specificity and sensitivity of the Beck Hopelessness Scale for suicidal ideation among adolescents entering early intervention service

Niklas Granö,[1,2] Jorma Oksanen,[1] Santeri Kallionpää,[1] Mikko Roine[1]

[1] Helsinki University Central Hospital,

Department of Psychiatry,

Finland

[2]To whom correspondence should be addressed: niklas.grano@hus.fi, tel. +35894711, Helsinki University Central Hospital, Department of Psychiatry, Jorvi Hospital, Turuntie 150, 02740 Espoo, Finland.

Abstract

Background: Previous studies have shown an association between hopelessness and suicidal behaviour in clinical populations. The aim of the study was to investigate sensitivity, specificity and

predictive validity of the Beck Hopelessness Scale (BHS) for suicidal ideation in adolescents who show early risk signs on psychiatric disorder continuum. *Methods:* Three-hundred and two help-seeking adolescents (mean age 15.5 years) who were entering an early intervention team at Helsinki University Central Hospital, Finland, completed questionnaires of BHS and suicidal ideation, derived from Beck Depression Inventory (BDI-II). *Results:* Results suggest that BHS cut-off score ≥8 (sensitivity 0.70, specificity 0.76) or cut-off score ≥ 9 (sensitivity 0.63, specificity 0.80) may be useful to detect suicidal ideation with BHS in help seeking adolescents population. Results remains mainly the same in a separate analysis with adolescents at risk for psychosis. *Conclusions:* Results support previous cut-off points for BHS in identification of suicidal ideation. Results suggest also that lower cut-off scores may be useful in sense of sensitivity, especially in clinical settings.

Key words: hopelessness, suicidal ideation, specificity, sensitivity, adolescents

1. Introduction

Hopelessness has been investigated for its association for suicidal behaviour (1-3). Previous studies show that suicide risk is associated with individuals diagnosed with psychotic disorders (4, 5) and Beck Hopelessness Scale (BHS) (1) has been used for hopelessness assessment in schizophrenia (6-8). However, studies of sensitivity and specificity of BHS for suicidal ideation in young people who are at the early stage on continuum of developing psychiatric disorder and might have attenuated psychotic experiences, is to our knowledge totally lacking.

A cut-off point ≥9 for BHS is the recommended cut-off point on the Beck Hopelessness Scale for identifying risk for suicide in non-psychotic populations and with psychiatric outpatients (3, 9). This standard cut-off point on the BHS identifies a high-risk group for potential suicide and those who are at risk of self-harm in the future. Further, Klonsky et al. (10) found with a sample of psychosis patients that a much lower cut-off point of 3 or more on BHS yielded to sensitivity and specificity values equal to those found in non-psychotic populations when using a cut-off point of 9 or more. In that study, very low cut-points were required to achieve high sensitivity, whereas specificity was high using cut-points of ≥5 and above. This may reflect a possibility that on a continuum of psychotic experiences subjects at risk for psychosis might have a lower cut-off point for suicidal behaviour than non-psychotic populations on BHS (10).

Hopelessness has shown to be the most important long-time risk factor for suicide (11). Screening adolescents on their early stage on possible development on continuum of psychiatric disorder may give an opportunity to detect adolescents at risk for suicidal behaviour in time. As subjects with psychotic disorders seem to have lower cut-off points for suicidal behaviour compared to general clinical populations, the aim of present study was to test specificity and sensitivity of BHS for suicidal ideation among adolescents entering to early intervention service, as in this population psychotic experiences are common and hence, these adolescents are especially at risk for later suicidality.

2. Methods

2.1. Subjects

Subjects in this study consist of clients at an early intervention team JERI (Jorvi Early psychosis Recognition and Intervention) at Helsinki University Hospital, Finland (12). The team met adolescents between ages 11 and 23. The contact to the team was made by a community worker (e.g. school nurse, GP or social worker) who contacted the team because their client had newly occurred and unclear mental health problems. The team was targeted for help-seeking adolescents with psychosis risk symptoms, even though lack of psychosis risk symptoms were not an exclusion criteria. Subjects were assessed at the beginning of the contact between April 1st 2009 and June 30th 2013. Project workers met 438 subjects out of total 843 telephone contacts. Of those 438 subjects, 310 adolescents who had any signs of psychiatric symptoms or decreased functioning ability, were asked to fill in the questionnaire and were interviewed. Due to missing data in scales, the total number of participants included in analysis was 302 subjects. The present study was accepted by the ethics committee of HUCH and voluntary participation in the study was emphasized. All subjects gave their informed consent prior to their inclusion in the study and all details that might disclose the identity of the subjects were omitted.

2.2. Instruments

2.2.1. Hopelessness. The Beck Hopelessness Scale (BHS) (1, 13) was used to assess hopelessness. BHS was originally designed to assess hopelessness in suicidal patients, and it is sensitive also to depression (1). BHS has high reliability (.93) (1) and high internal consistency

(alpha=.92) (9). BHS consists of 20 true-false items (an item example: 1. I look forward to the future with hope and enthusiasm). Items 2, 4, 7, 9, 11, 12, 14, 16, 17, 18 and 20 are keyed true and items 1, 3, 5, 6, 8, 10, 13, 15 and 19 are keyed false. Each response is scored as 0 or 1, and the total hopelessness score is a sum score of all responses.

2.2.2. Suicidal ideation. Beck Depression Inventory II (BDI-II) was used to measure suicidal ideation. The BDI-II measures the severity of self-reported depression over the previous two weeks (14). The Finnish version of the scale was used in the present study (15). The scale has shown to have good reliability and construct validity in young people with psychotic experiences (16). Suicidal ideation was derived from BDI-II question 9 (range 0-3). Question alternatives are "I don't have any thoughts of killing myself", "I have thoughts of killing myself, but I would not carry them out", "I would like to kill myself"," I would kill myself if I had the chance". Questions were divided into a dichotomous variable. Question alternative "I don't have any thoughts of killing myself" was classified to 0 (no suicidal ideation) and other variables to 1 (suicidal ideation) to describe status of suicidal ideation. This item has found to correlate with other measures of suicidal ideation and is has shown to predict completed suicide (17).

2.2.3. Psychosis risk. The PROD screen has shown good specificity and sensitivity for psychosis risk-status with the cut-off point ≥2 (18) which was also used in the present study. Participants were interviewed after they had completed the PROD screen to distinguish true positive risk symptoms from self-reported symptoms. PROD psychosis risk symptoms were rated positive in interview if symptom severity was equal to SIPS (Structured Interview for Psychosis-Risk Syndromes) score 3-6 (19). These PROD based interviewed positive scores were used to assess the risk status.

2.2.4. Demographics. Age was assessed as full years at the time of the assessment. Gender was assessed as a binary variable.

2.3. Statistical analysis

Specificity, sensitivity, positive predictive value (PPV) and negative predictive value (NPV) of BHS scores with different cut-off points against presence of suicidal ideation were calculated. ROC-curve with area under the curve was analysed. Means, standard deviations and distributions of variables were calculated. The data was scored and analysed with PASW 19.0 (20) statistical package.

3. Results

Of all participants (N=302), 142 were boys and 167 were girls (mean age 15.5 years, SD 2.23). (Table 1.). Suicidal ideation was present in 109 subject (36%) and 92 subjects (30%) had status of risk for psychosis. Cronbach alpha was .895 for BHS (range 0-20; mean 7.2, SD 5.2 points). BHS cut-off score ≥7 reached sensitivity 0.73 and specificity 0.70 with Positive Predictive Value (PPV) 58% and Negative Predictive Value (NPV) 82%. BHS cut-off score ≥ 8 reached specificity 0.76 and sensitivity 0.70 with PPV 62% and NPV 82%. Cut-off score ≥ 9 reached specificity 0.80 and sensitivity 0.63 with 65% PPV and 79% NPV. ROC-curve showed value of 0.798 for area under the curve as BHS sum score for suicidal ideation (Figure 1). In an additional analysis (Table 2) conducted separately with subjects at risk for psychosis (N=92) BHS cut-off score ≥ 8 reached specificity 0.63 and sensitivity 0.74 and cut-off score ≥ 9 reached specificity 0.68 and sensitivity 0.65. In subjects not at risk for psychosis (N=210) BHS cut-off score ≥ 8 reached specificity 0.79 and sensitivity 0.65 and cut-off score ≥ 9 reached specificity 0.83 and sensitivity 0.62 (Table 3.).

-- Tables 1 - 3, and Figure 1 about here--

4. Discussion

In the present study we found that BHS cut-off score ≥ 8 or cut-off score ≥ 9 may be useful to detect suicidal ideation with BHS in help seeking adolescents' population with a reasonable specificity and sensitivity. A separate analysis with adolescents at risk for psychosis suggested also same cut-off points, even though with slightly lower specificity and sensitivity. Depending on the purpose of screening, a lower cut-off point may be useful for this population for clinical use, if it is accepted to have a larger proportion of false positives in a sense of higher sensitivity. However, in that case PPV will reduce remarkable.

In general, present results are in line with previous studies. Current sample consisted of young subjects who were entering into early intervention service and 30% of them displayed

psychosis risk status. Hence, best sensitivity and specificity rates at BHS in our study are between those two earlier studies conducted with subjects suffering of psychotic disorders (10) and with subjects from general clinical population (3). Moreover, in the present study mean score of BHS was 7.2, which is the same as Kao et al. (6) found with schizophrenia patients, supporting the idea that subjects of this present study had tendency for serious mental health problems, even though they were just entering into the service. Klonsky et al. (10) found with a sample of psychosis patients that a cut-off point of 3 or more on BHS yielded to sensitivity and specificity values similar to those found in non-psychotic populations when using a cut-off point of 9 or more in BHS. However, we had higher cut-off points for sensitivity and specificity than Klonsky et al. (10), as they reported that cut-off point of ≥5 yielded a sensitivity of 0.58 and specificity of 0.70 and we found in our study that cut-off score ≥7 reached sensitivity 0.73 and specificity 0.70. Hence, our results are more comparable with specificity and sensitivity studies conducted with non-psychotic clinical populations (3), as only 30% of subjects in our sample had psychosis risk status. Moreover, in a separate analysis with subjects with psychosis risk status, we found that the best specificity and sensitivity rates were reached also with cut-off points ≥8 or ≥9, even though specificity and sensitivity scores were then about the same as at cut-off point level ≥6 in a subgroup of subjects who were not at risk for psychosis. At the same time, in psychosis risk group was suicidal ideation present about two times more often than in not at risk group (26.2% vs. 58.7%). Hence, even though suicidal ideation is more common in adolescents at risk for psychosis and at risk adolescents have higher mean scores of BHS than other adolescents (9.4 vs. 6.3) it is not possible to reach a clearly separate cut-off point for this group.

Even though there are no previous research of BHS cut-off scores against suicidal ideation in adolescent samples, the phenomenon itself has been studied elsewhere. Eskelinen et al. (21, 22) have reported with healthy controls, subjects with benign breast disease and breast cancer that hopelessness is associated with suicidal thoughts and Beck Depression Inventory scale scores in both self- rating and examiner-rating, which supports present findings. Moreover, in a recent review Lester (23) reported that BHS mean scores in general adolescent population were 3.62 (SD 0.95) among American students and 4.75 (SD 1.63) of students in all other countries. Compared to these findings are level of BHS scores clearly higher in our study, reflecting the clinical nature of our sample.

In summary, present results suggest that traditional cut-off score 9 or more in BHS or lower cut-off score 8 or more may be useful to detect potential suicidal ideation in adolescents entering to health care. Hopelessness, as it is clearly associated with suicidal ideation, should be detected in clinical adolescent and young adult populations and become a target of therapeutic work in order to

reduce suicidality. ~~Hence, using BHS beside of direct questions of suicidal behaviour is recommend.~~

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Disclosure of interests

None to declare.

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Table 1. Sensitivity and specificity of different cut-off points in Beck Hopelessness Scale for presence of suicidal ideation in help seeking adolescents (N=302).

	N	Sensitivity	Specificity	PPV [4]	NPV [5]
Gender					
Male	138				
Female	164				
Total	302				
Age (range 11-23 years)[1]	15.5 (2.2)				
Subjects at risk for psychosis [2]	92 (30%)				
Subjects having Suicidal ideation (BDI item 9)	109 (36%)				
BHS (range 0-20) [1]	7.2 (5.2)				
BHS cut-off[3] >=4	208	0.90	0.43	47%	88%
BHS cut-off[3] >=5	185	0.84	0.52	50%	85%
BHS cut-off[3] >=6	157	0.77	0.62	54%	83%
BHS cut-off[3] >=7	138	0.73	0.70	58%	82%
BHS cut-off[3] >=8	122	0.70	0.76	62%	82%
BHS cut-off[3] >=9	107	0.63	0.80	65%	79%
BHs cut-off[3] >=10	88	0.57	0.87	70%	78%

BHS cut-off[3] >=11	79	0.54	0.90	75%	78%

[1] Mean and SD; [2] N of subjects at risk for psychosis according to PROD –screen criteria (Heinimaa et al, 2003); [3] N of subjects scoring equal or above the cut-off score; [4] Positive Predictive Value; [5] Negative Predictive Value

Table 2. Sensitivity and specificity of different cut-off points in Beck Hopelessness Scale for presence of suicidal ideation in help seeking adolescents in psychosis risk group (N=92).

	At risk for psychosis[2]				
	N[3]	Sensitivity	Specificity	PPV[4]	NPV[5]
Gender					
Male	30				
Female	62				
Total	92				
Age (range 12-23 years)[1]	15.8 (2.4)				
Subjects having Suicidal ideation (BDI item 9)	54 (58.7%)				
BHS (range 0-20) [1]	9.4 (5.0)				
BHS cut-off[3] >=4	81	0.93	0.18	62%	64%
BHS cut-off[3] >=5	76	0.87	0.24	62%	56%
BHS cut-off[3] >=6	69	0.83	0.37	65%	61%
BHS cut-off[3] >=7	63	0.81	0.50	70%	66%
BHS cut-off[3] >=8	54	0.74	0.63	74%	63%
BHS cut-off[3] >=9	47	0.65	0.68	74%	58%
BHs cut-off[3] >=10	38	0.56	0.79	79%	56%
BHS cut-off[3] >=11	32	0.50	0.87	84%	55%

[1] Mean and SD; [2] subjects at risk for psychosis according to PROD –screen criteria (Heinimaa et al, 2003); [3] N of subjects scoring equal or above the cut-off score; [4] Positive Predictive Value; [5] Negative Predictive Value

Table 3. Sensitivity and specificity of different cut-off points in Beck Hopelessness Scale for presence of suicidal ideation in help seeking adolescents not at risk for psychosis (N=210).

		Not at risk for psychosis[2]			
	N[3]	Sensitivity	Specificity	PPV[4]	NPV[5]
Gender					
Male	108				
Female	102				
Total	210				
Age (range 11-22 years)[1]	15.3 (2.1)				
Subjects having Suicidal ideation (BDI item 9)	55 (26.2%)				
BHS (range 0-20) [1]	6.3 (5.0)				
BHS cut-off[3] >=4	127	0.87	0.49	38%	92%
BHS cut-off[3] >=5	109	0.82	0.59	41%	90%
BHS cut-off[3] >=6	88	0.71	0.68	44%	87%
BHS cut-off[3] >=7	75	0.65	0.75	48%	86%
BHS cut-off[3] >=8	68	0.65	0.79	53%	87%
BHS cut-off[3] >=9	60	0.62	0.83	57%	86%
BHs cut-off[3] >=10	50	0.58	0.88	64%	86%
BHS cut-off[3] >=11	47	0.58	0.90	68%	86%

[1] Mean and SD; [2] subjects at risk for psychosis according to PROD –screen criteria (Heinimaa et al, 2003); [3] N of subjects scoring equal or above the cut-off score; [4] Positive Predictive Value; [5] Negative Predictive Value

Figure 1. ROC-curve of Beck Hopelessness Scale scores against suicidal ideation (value of 0.798 for area under the curve; N=302).