Quality of life in adolescents and young adults after traumatic experience

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Abstract

Exposure to potentially traumatic life events is a risk factor for different kinds of mental health problems, like post-traumatic stress disorder (PTSD), depression and anxiety disorders, as well as physical health problems and lower quality of life (QOL). Less is known about implications of trauma and post-traumatic symptoms on QOL in youth. We present here analyses of QOL in two samples of students (N = 231 and N = 187) exposed to a mass shooting in their schools. Used symptom measures included Impact of Event Scale (IES-22) and the General Health Questionnaire 12-item version (GHQ-12). The QOL was assessed with five questions from the European Health Interview Survey-Quality of Life (EUROHIS-QOL) 8-item index. The exposed adolescents and young adults had lower overall QOL scores compared to unexposed students, but the difference was not striking. There was a small improvement in QOL scores in subsamples over a two-year period. IES-22 and GHQ-12 scores correlated negatively with QOL, but when analysed simultaneously effects of post-traumatic stress symptoms on overall QOL scores faded away. GHQ-12 scores and perceived health mainly explained the variance in the overall QOL scores. The implication was that trauma-related depressive symptoms or more general psychological symptoms may have a larger impact on QOL than PTSD symptoms alone. Yet, those who were recovering from post-traumatic symptoms over the two year follow-up also had improving QOL scores. When assessing youths after potentially traumatic experiences, diverse symptoms should be queried, and aspects of quality of life and functioning should also be considered.

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Introduction

Consequences of experiencing traumatic life events are broad. Psychological trauma is a generic risk factor for mental health problems. Mental disorders associated with traumatic experience include post-traumatic stress disorder (PTSD), depression and anxiety disorders. Physical health problems as well as reduced quality of life may be other corollaries.

There is no single definition of quality of life (QOL). Accordingly, there is no single method of assessing QOL. The World Health Organization Quality of Life group defines QOL as "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (1). Thus, QOL is about subjective satisfaction in different domains of life. A narrower definition is health-related quality of life (HRQOL) that aims to capture the aspects of QOL that are influenced by health.

Adolescent QOL and assessing it may need age and a developmentally sensitive approach. One adolescent study that aimed to determine adolescent QOL found five underlying or latent factors: social, environment, psychological, health and opportunities for growth (2). The environment was found to be a primary factor having direct and indirect effects on the other four factors. Variance in QOL associated with age, control, opportunities available and perceptions of physical health (3). Adolescents seemed to rate QOL and self-rated health as two distinct constructs similar to adults (4). Lower QOL in adolescence has been found to associate with several types of chronic health conditions (5, 6)

PTSD and post-traumatic stress symptoms impact on physical health-related quality of life as well as categories of general health symptoms and general medical conditions in adults, see e.g. the meta-analysis by Pacella et al. (7). All anxiety disorders hamper quality of life but PTSD patients have more severe impairment compared to other anxiety disorders (8). The role of comorbid depression with adult PTSD was highlighted by treatment-seeking PTSD outpatients whose QOL was negatively affected not only by PTSD symptom severity but also by comorbid depressive symptom severity and childhood abuse (9).

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Different types of traumatic events and related PTSD or post-traumatic symptoms impact on QOL. For example, PTSD symptoms in physically injured victims of non-domestic violence predicted lower scores on all domains of the World Health Organization Quality of Life Instrument (WHOQOL-BREF) over a one-year follow-up (10). Among adult earthquake survivors, PTSD symptoms negatively influenced QOL and it was indicated that social support moderated effects of PTSD symptoms on QOL (11).

Post-traumatic stress and depression were negatively related to QOL in a Norwegian sample of adult tsunami survivors after two and six years and post-traumatic growth moderated these effects (12). In a larger Norwegian tsunami survivor sample, women reported higher quality of life and more post-traumatic stress than men after two years (13). Post-traumatic stress seemed to mediate exposure severity's impact on QOL.

Injured in road traffic accidents reported low physical and mental health-related QOL measured with The Short Form Health Survey (SF-36) after a two-year follow-up (14). Overall physical health-related QOL improved with higher expectations of returning to work while mental health-related QOL did not improve over time. Lower mental health-related QOL associated with increasing pain, PTSD, major depressive episode and generalized anxiety disorder.

There are only few studies on adolescent QOL related to traumatic experience or PTSD. In one old study with an adolescent sample, PTSD and depression had a negative effect on different domains of functioning and satisfaction with life (15). Major physical trauma-related acute stress disorder, chronic PTSD and depression significantly impact on QOL of adolescents (16-18).

Child and adolescent survivors of the 2008 Sichuan earthquake had significantly lower QOL than healthy control children, measured with the Pediatric Quality of Life Inventory (PedsQL) up to three years after the incident (19). Mental health symptoms, PTSD and depression were main predictors for reporting lower QOL. Girls and older children also reported lower QOL.

QOL measured with Quality of Life Questionnaire (QOLQ) was negatively correlated with PTSD and depression in adolescent survivors of the 1999 Parnitha earthquake close to three years after the incident (20). Early depression was the best predictor of reporting later lower QOL.

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We examined here QOL in two samples of students exposed to a mass shooting in their schools in a follow-up setting. The mass shooting incidents occurred at Jokela Middle and High School in 2007 and at Kauhajoki educational centre in 2008. We have previously reported probable PTSD in 19% of the Jokela students assessed four months after the event (21). We hypothesized that trauma exposure, PTSD and general psychological symptoms negatively impact on QOL in youth.

Methods

The data presented here is based on the two samples of adolescents and young adults exposed to a school shooting in their schools and their respective comparison students from unexposed schools. Repeated questionnaires were performed four months (baseline), 16 months and 28 months after the incident. Participation was voluntary and participants were asked to sign a written informed consent. Signed informed consent was required from parent or guardian of the students under 15 years of age. Study protocol has been previously described in detail (21, 22). The study protocols were accepted by the Ethics Committee of Helsinki University Central Hospital and the Ethics Committee of Hospital District of Southern Ostrobothnia, Finland.
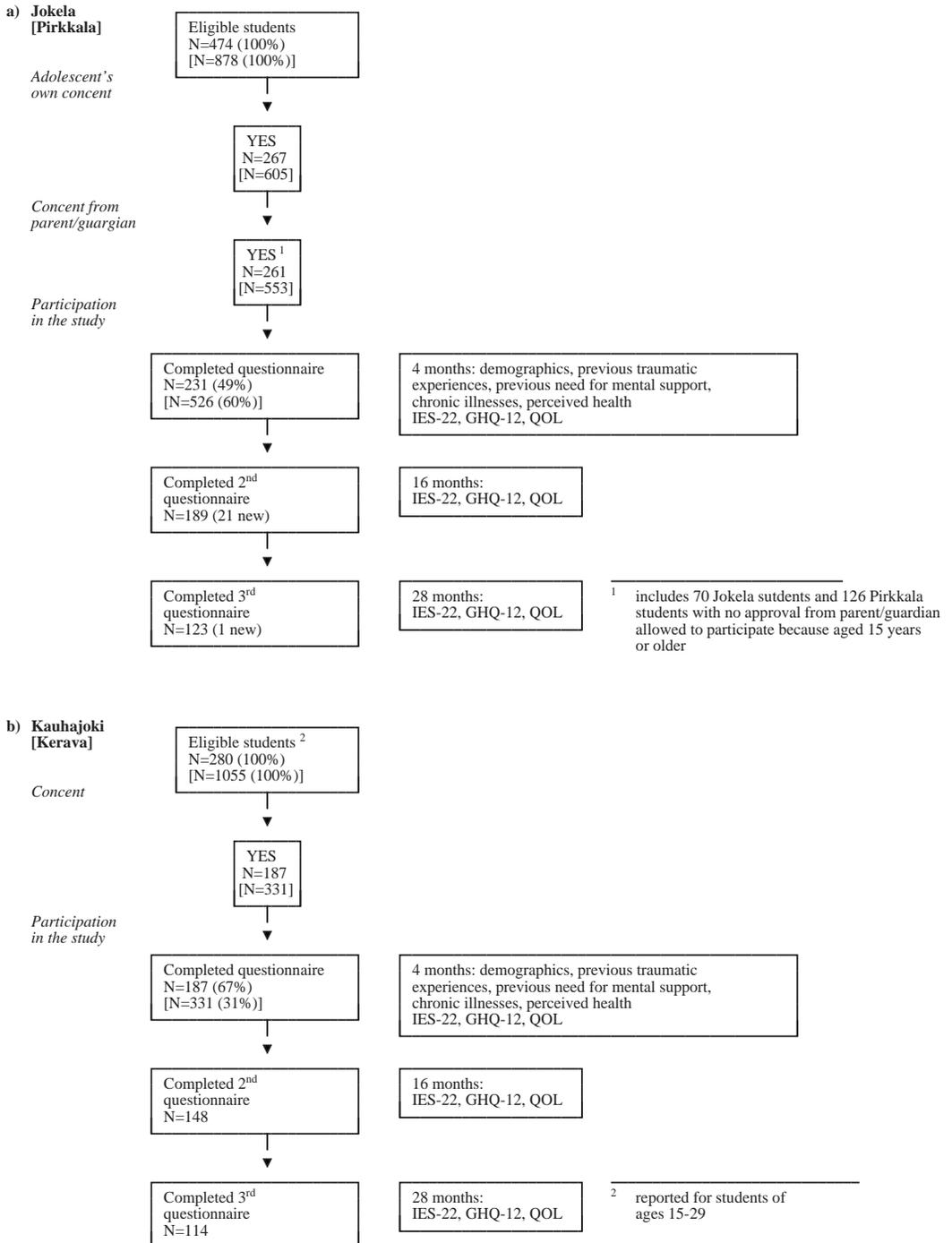
Subjects

All the students of the Jokela Middle and High school, aged 13-19 years, were invited to participate in the study (N = 474). About half of the students (N = 231, 49%) participated in the baseline questionnaire (Figure 1). Mean age was 15.0 (SD = 1.7). Non-participation at baseline was related to male gender but not to age, 65% females and 35% males participated (p < 0.001). New participants were allowed to enter the study at 16-month follow-up and 21 new subjects entered the study at this point yielding 189 participants, with 123 participants continuing to 28 months. Females continued more often in the study than males, but neither exposure level nor post-traumatic symptom severity associated with dropping out from the study.

Similarly, all the students of the Kauhajoki educational centre were asked to participate in the study. However, the results of the students of ages 15-29 years (N = 280) are reported here. The Kauhajoki educational centre is a combination of

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vocational school and university of applied sciences. Two-thirds (67%) of the students aged under 30 years (N = 187) completed the questionnaire at baseline (Figure 1). From those who completed the questionnaire 5% were males and 95% females (the Kauhajoki centre had a vast majority of female students). Mean age of the participants was 20.1 years (SD = 3.2). Non-participation was related to male gender (72% of males vs. 28% of females did not participate, $p < 0.001$), and participants were younger than non-participants ($p < 0.001$). 148 students participated at 16-month follow-up and 114 at 28-month follow-up. Younger students were more likely to participate in the follow-ups, and males did drop out more often at 28 months. Again, neither exposure level nor post-traumatic symptom severity associated with dropping out from the study.

The comparison group for Jokela students was drawn from the students of Pirkkala Middle and High School (N = 878). Almost two-thirds of the students (N = 526, 60%) participated in the baseline questionnaire. Mean age was 14.7 (SD = 1.5) and non-participation was more common among males than females (53% vs. 25%, $p < 0.001$). An educational centre from Kerava was chosen to be a comparison school for Kauhajoki. About one-third of the students participated at baseline (N = 331/1055, 31 %). Mean age was 20.0 (SD = 3.5) and 39% were males and 61% females. Only baseline data from the comparison samples were used here.

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Figure 1. Flow chart of the recruitment process and participation in the study, and used measures.

a) **Jokela [Pirkkala]**

Adolescent's own concent

Eligible students
N=474 (100%)
[N=878 (100%)]

YES
N=267
[N=605]

Concent from parent/guardian

YES [1]
N=261
[N=553]

Participation in the study

Completed questionnaire
N=231 (49%)
[N=526 (60%)]

4 months: demographics, previous traumatic experiences, previous need for mental support, chronic illnesses, perceived health
IES-22, GHQ-12, QOL

Completed 2nd questionnaire
N=189 (21 new)

16 months:
IES-22, GHQ-12, QOL

Completed 3rd questionnaire
N=123 (1 new)

28 months:
IES-22, GHQ-12, QOL

_____
[1] includes 70 Jokela sutdents and 126 Pirkkala students with no approval from parent/guardian allowed to participate because aged 15 years or older

b) **Kauhajoki [Kerava]**

Concent

Eligible students [2]
N=280 (100%)
[N=1055 (100%)]

YES
N=187
[N=331]

Participation in the study

Completed questionnaire
N=187 (67%)
[N=331 (31%)]

4 months: demographics, previous traumatic experiences, previous need for mental support, chronic illnesses, perceived health
IES-22, GHQ-12, QOL

Completed 2nd questionnaire
N=148

16 months:
IES-22, GHQ-12, QOL

Completed 3rd questionnaire
N=114

28 months:
IES-22, GHQ-12, QOL

_____
[2] reported for students of ages 15-29

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Questionnaire

The questionnaire included items about demographics, background characteristics like previous experiences of traumatic events, previous need for mental support, chronic illnesses and perceived health. Perceived health was asked with a question: *What do you think about your health? is it...,* answered on a 5-point scale ranging from very good to very bad. However, answers were dichotomized (good and very good; and neither good nor bad, bad and very bad). The severity of exposure to the index trauma was rated based on threat to life and losses suffered (21). The answers were categorized into three levels of severity: mild to moderate, significant and severe to extreme exposure. For example significant exposure was rated when a student had to act to escape the shooter or had to hide to avoid life danger or saw bodies or lost acquaintances, and severe to extreme exposure was when a student was near or in mortal danger or saw somebody threatened by gun or being shot or lost friend(s) or somebody significant. Distribution of exposure severity in Jokela was: mild to moderate 15 (5.7%), significant 159 (64.4%) and severe to extreme 74 (30.0%), and in Kauhajoki: mild to moderate 80 (42.8%), significant 88 (47.1%), severe to extreme 19 (10.2%).

Post-traumatic stress symptoms were measured by the Impact of Event Scale (IES) (23) version that includes 22 items mapping the symptoms of intrusion, avoidance and hyperarousal. Participants estimated symptom items on a scale: 0 = not at all, 1 = rarely, 3 = sometimes, 5 = often, based on their experiences during the previous week. Participants were instructed to use the school shooting as a reference incident at baseline questionnaire and the most distressing life event was to be used at follow-up questionnaires. IES-22 sum scores (range 0-110) were calculated and used as continuous variables. Good internal consistency was observed, for example Cronbach's α for IES-22 was 0.95 with Jokela and 0.94 with Kauhajoki samples at baseline. Mean scores for IES-22 among all participating students in Jokela were 27.1 (SD = 24.5) at four months, 22.8 (24.4) at 16 months and 15.8 (19.1) at 28 months, and among all participating students in Kauhajoki 29.4 (23.2), 16.8 (18.7) and 12.1 (17.4) respectively.

The General Health Questionnaire 12-item version (GHQ-12) was used to evaluate general psychological symptoms for the previous month (24). The symptoms enquired were, for example: *Have you been feeling unhappy or depressed?,* rated on a scale: 0 = not at all, 1 = no more than usual, 2 = rather more than usual, 3 = much more than usual. When calculating the sum score, the 4-point Likert scale items were first scored in a

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bimodal fashion (0-0-1-1) and the range of the scale is 0-12. Cronbach's α for GHQ-12 was 0.88 with Jokela and 0.91 with Kauhajoki samples at baseline. Mean scores for GHQ-12 among all participating students in Jokela were 2.6 (SD = 3.2) at baseline, 2.2 (3.1) at 16 months and 1.6 (2.4) at 28 months, and among all participating students in Kauhajoki 3.4 (3.4), 1.8 (2.6) and 1.5 (2.7) respectively.

Quality of life (QOL) was assessed with five questions from the European Health Interview Survey-Quality of Life (EUROHIS-QOL) 8-item index that has been abbreviated from the WHOQOL-100 and the WHOQOL-BREF (25-28). These eight items fall into a universal one-factor structure in confirmatory factor analysis (29, 30). The items included in this study were: *1) How would you rate your quality of life? 2) Do you have enough energy for everyday life? 3) How satisfied are you with your ability to perform your daily activities? 4) How satisfied are you with yourself? 5) How satisfied are you with your personal relationships?* Each question has an individualized answer in a five-point Likert scale ranging from not at all to completely. Three items from EUROHIS-QOL were omitted due to the limited number of possible items in the questionnaire (satisfaction with health, having enough money for needs and satisfaction with living conditions) leaving out the especially environmental domain of QOL, other domains being psychological, physical and social. The first and direct question of quality of life was used as a dichotomous measure (good and very good; and neither good nor bad, bad and very bad). *The overall QOL score* was calculated as a mean score of the five items (range 1-5), with higher scores indicating better QOL. Cronbach's α for overall QOL score varied from 0.82 to 0.85 between study groups at baseline.

Data Analysis

The distributions of variables were presented as percentages for categorical variables and mean (M) and standard deviations (SD) for continuous variables. Differences between the groups were tested using the chi-square test, analysis of variance ANOVA. Repeated samples t-test and effect sizes (Cohen's d) were calculated to estimate the magnitude of change in overall quality of life over follow-up time. Correlation analyses were performed to assess association of different variables with overall QOL score (Pearson's correlation (r) with continuous variables, a point-biserial correlation with dichotomous variables (r) and Spearman's rank correlation (rho) with ordinal variables). Linear regression models were tested for different variables possibly explaining variance in overall QOL. Post-traumatic symptom trajectories were

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constructed with latent class growth analysis (31). Best-fitting model, i.e. number of different symptom trajectories, was based on model fit indices, as well as other criteria like divergence of class trajectories from each other, parsimony and sufficient class sizes. Full information maximum likelihood method was used to impute missing data (32).

In general, p-values of < 0.05 were considered statistically significant, but in cases of multiple testing conservative Bonferroni corrected significance levels are provided. Analyses were performed using SPSS 22.0 for Windows and Mplus 7 (31).

Results

Does trauma exposure reduce quality of life?

In Jokela 84.4% of the students rated their quality of life good or very good at four months after traumatic experience, while 87.0% of Pirkkala students rated their quality of life to be good or very good. Similarly, 81.6% of Kauhajoki students rated their quality of life to be good or very good compared to 87.7% by Kerava students (Table 1). Proportions of the exposed students rating their experience on quality of life either good or moderate-bad were compared with their respective comparison students by gender and total sample. There were no significant differences between males, females or total samples with Jokela students compared to Pirkkala students or with Kauhajoki students compared to Kerava students (Table 1).

The overall QOL mean score was 3.83 in the Jokela sample, 3.94 in the Pirkkala sample, 3.79 in the Kauhajoki sample and 3.98 in the Kerava sample. There were differences in mean scores between Jokela and Pirkkala total sample and between Kauhajoki and Kerava females and total sample, although absolute differences in the means seem small (Table 1).

Does quality of life improve among trauma-exposed over time?

Comparisons were made between means of the overall QOL scores at four months and 16 months, at 16 months and 28 months and finally over the entire follow-up from baseline to 28 months. The samples having information from both time-points in question were included in the analyses. There were no changes over time with Jokela students, but there was an improvement with Kauhajoki students especially during the second year of the follow-up (Table 2). There was also improvement among females in the pooled Jokela and Kauhajoki sample and total sample when analysing the entire follow-up period. All these improvements were small in effect size.

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Table 1. Differences in quality of life between trauma-exposed students and comparison students four months after traumatic incident.

	Exposed Jokela (N=231)	Compar. Pirkkala (N=526)			Exposed Kauhajoki (N=187)	Compar. Pirkkala (N=331)		
How would you rate your quality of life? N (%)			χ^2	p			χ^2	p
Males Moderate-bad Good	12 (13.3) 78 (86.7)	27 (11.9) 199 (88.1)	0.11	0.74	3 (33.3) 6 (66.7)	14 (11.1) 112 (88.9)		exact 0.09
Females Moderate-bad Good	24 (17.0) 117 (83.0)	41 (13.8) 257 (86.2)	0.81	0.37	31 (17.6) 145 (82.4)	26 (13.0) 174 (87.0)	1.55	0.21
Total Moderate-bad Good	36 (15.6) 195 (84.4)	68 (13.0) 456 (87.0)	0.92	0.34	34 (18.4) 151 (81.6)	40 (12.3) 286 (87.7)	3.56	0.06
Overall QOL score, M (SD)			F	p			F	p
Males	3.88 (0.53)	4.03 (0.50)	4.85	0.03	3.71 (0.98)	4.04 (0.69)	2.27	0.13
Females	3.79 (0.59)	3.87 (0.56)	1.95	0.16	3.79 (0.59)	3.94 (0.55)	6.57	0.01*
Total	3.83 (0.57)	3.94 (0.54)	6.50	0.01*	3.79 (0.61)	3.98 (0.57)	12.75	<0.001***

Significance levels: * $p < 0.025$ (=0.05/2), ** $p < 0.01$, *** $p < 0.001$.

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Table 2. Changes in overall level of quality of life among exposed students during the follow-up.

	QOL, mean (SD)		t^{a}	p	d^{b}
	4 months	**16 months**			
Jokela	3.81 (0.59)	3.86 (0.60)	1.21	0.23	0.09
Kauhajoki	3.80 (0.59)	3.85 (0.56)	1.22	0.22	0.10
Males	3.85 (0.64)	3.90 (0.63)	0.66	0.51	0.09
Females	3.80 (0.58)	3.85 (0.57)	1.57	0.12	0.10
Total	3.81 (0.59)	3.86 (0.58)	1.70	0.09	0.10
	16 months	**28 months**			
Jokela	3.90 (0.58)	3.91 (0.59)	0.36	0.72	0.03
Kauhajoki	3.85 (0.56)	3.93 (0.57)	2.13	0.04	0.21
Males	3.81 (0.69)	3.87 (0.61)	0.72	0.48	0.13
Females	3.89 (0.55)	3.93 (0.58)	1.42	0.16	0.10
Total	3.86 (0.57)	3.92 (0.58)	1.59	0.11	0.11
	4 months	**28 months**			
Jokela	3.83 (0.57)	3.89 (0.58)	0.99	0.33	0.09
Kauhajoki	3.78 (0.64)	3.96 (0.55)	3.61	<0.001***	0.34
Males	3.77 (0.71)	3.86 (0.59)	0.84	0.41	0.16
Females	3.81 (0.59)	3.93 (0.56)	2.92	0.004**	0.21
Total	3.81 (0.61)	3.93 (0.56)	3.02	0.003**	0.20

[a] Repeated measures t-test with subjects having information from both follow-up times.

[b] Cohen's d, effect size. Significance levels: * $p < 0.0167$ (=0.05/3), ** $p < 0.01$, *** $p < 0.001$.

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What factors associate with quality of life?

General background characteristics did not associate with overall QOL scores in the pooled sample at four months (study group: $r = -0.03$, $p = 0.49$; gender: $r = 0.06$, $p = 0.23$; age: $r = -0.07$, $p = 0.18$; chronic illness: $r = -0.05$, $p = 0.32$). Previous trauma experience and previous need for mental support associated with overall QOL scores (rho $= -0.23$, $p < 0.001$; $r = -0.16$, $p = 0.001$, respectively).

Severity of trauma exposure did not correlate with overall QOL scores (rho $= -0.03$, $p = 0.58$). Post-traumatic symptoms measured with IES-22 at four months correlated with overall QOL, with higher symptoms reducing it ($r = -0.43$, $p < 0.001$). Likewise, general psychological symptoms measured with GHQ-12 correlated negatively with overall QOL ($r = -0.64$, $p < 0.001$). Although chronic illness did not correlate with overall QoL, worse perceived health did reduce it ($r = -0.44$, $p < 0.001$).

Of note, IES-22 scores correlated with gender, previous trauma experience, severity of exposure and perceived health but not with previous need for mental support. GHQ-12 scores correlated broadly with other variables: study group, gender, age, chronic illness, previous trauma experience and previous need for mental support, severity of exposure, IES-22 scores and perceived health.

Those variables that significantly correlated in bivariate analyses with overall QOL scores were tested in several linear regression models. Post-traumatic stress symptoms could alone explain 19% of the variance in overall QOL at four months, and general psychological symptoms could alone explain 41% of the variance in overall QOL scores (Table 3) when combined general psychological symptoms only remained significant. Previous trauma experience and previous need for mental support were not significant in multiple linear regression models with post-traumatic stress symptoms and general psychological symptoms. Adding perceived health into the regression models increased the explained variance in overall QOL scores to 47% (Table 3). Tests for multicollinearity did not indicate multicollinearity problems (variance inflation factor < 2.5) between the variables.

Does quality of life improve if post-traumatic symptoms are relieved?

Constructing post-traumatic symptom trajectories from IES-22 scores with latent class growth analysis suggested three different trajectories to present the best model. These trajectories could be described as low symptoms, recovering and high symptoms

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over the follow-up period. Mean IES-22 and GHQ-12 scores and mean overall QOL scores at different follow-up times by these trajectories are shown in Table 4. Overall QOL scores differed between the post-traumatic symptom trajectory groups. In post hoc analyses, the recovering group did not differ from the high post-traumatic symptoms group at baseline but differed from the low symptoms group, i.e. recovering group had similar mean overall QOL scores as high symptoms group at baseline. After two years the recovering group had somewhat but not significantly better mean QOL scores than the high symptoms group. Yet the recovering group's QOL scores no longer differed from the low symptoms group and therefore seemed to improve over time (Table 4).

Table 3. Linear regression models on variables explaining overall quality of life among exposed students four months after traumatic incident.

	B	S.E	Beta	p	Model R	R2
Model 1					0.43	0.19
IES-22	-0.01	0.00	-0.43	<0.001		
Model 2					0.64	0.41
GHQ-12	-0.11	0.01	-0.64	<0.001		
Model 3					0.64	0.41
IES-22	0.00	0.00	0.00	0.99		
GHQ-12	-0.12	0.01	-0.64	<0.001		
Model 4					0.66	0.43
IES-22	0.00	0.00	0.03	0.62		
GHQ-12	-0.12	0.01	-0.66	<0.001		
Previous trauma experience	-0.04	0.04	-0.04	0.30		
Previous need for mental support	-0.02	0.07	-0.01	0.76		
Model 5					0.69	0.47
IES-22	0.00	0.00	0.03	0.62		
GHQ-12	-0.10	0.01	-0.58	<0.001		
Previous trauma experience	-0.03	0.03	-0.04	0.33		
Previous need for mental support	-0.04	0.06	0.02	0.55		
Perceived health	-0.46	0.08	-0.24	<0.001		
Model 6					0.68	0.46
GHQ-12	-0.10	0.01	-0.55	<0.001		
Perceived health	-0.48	0.07	-0.26	<0.001		

Significant p-value is < 0.0083 (=0.05/6).

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Table 4. Post-traumatic stress symptoms and overall quality of life among exposed students by latent symptom classes during the follow-up.						
	Post-traumatic stress symptom trajectories					
	Low symptoms	**Recovering**	**High symptoms**	**F**	**p**	**Post hoc analyses (Scheffé)**
IES-22, M (SD)						
4 months	19.0 (16.4)	45.3 (20.1)	70.6 (18.6)	191.21	<0.001	p <0.001 between all pairs
16 months	8.3 (7.7)	38.6 (10.4)	73.1 (10.1)	961.20	<0.001	p <0.001 between all pairs
28 months	8.7 (12.4)	21.3 (21.0)	49.2 (16.6)	65.64	<0.001	p <0.001 between all pairs
GHQ-12, M (SD)						
4 months	2.0 (2.5)	4.9 (3.4)	7.3 (3.7)	79.36	<0.001	p <0.001 between all pairs
16 months	1.1 (1.9)	3.5 (3.2)	6.5 (3.2)	82.81	<0.001	p <0.001 between all pairs
28 months	1.1 (2.0)	2.6 (3.3)	3.8 (3.5)	14.69	<0.001	Low vs. Recovering p=0.001, Recovering vs. High p=0.19
QOL, M (SD)						
4 months	3.91 (0.54)	3.56 (0.55	3.35 (0.69)	24.31	<0.001	Low vs. Recovering p<0.001, Recovering vs. High p=0.16
16 months	3.98 (0.53)	3.64 (0.59	3.41 (0.62)	20.70	<0.001	Low vs. Recovering p<0.001, Recovering vs. High p=0.18
28 months	3.99 (0.49)	3.87 (0.69)	3.49 (0.76)	6.24	0.002	Low vs. Recovering p=0.47, Recovering vs. High p=0.07

Discussion

Trauma-exposed adolescents and young adults did not report, when directly asked, their quality of life to be different from their comparison group, contrary to our hypothesis. However, when a broader set of quality of life questions were used as an indicator, there were differences between Jokela and Pirkkala samples and especially between females in Kauhajoki and Kerava samples. There was a small improvement in overall QOL in the Kauhajoki sample and among females, and as a result in all exposed students over the two-year follow-up. There are no studies tracking quality of life changes with young age groups after psychological trauma. The effect sizes of overall QOL improvement were similar to depression patients after nine months follow-up in the sensitivity to change evaluation of EUROHIS-QOL (30). Sensitivity to change was also demonstrated in analyses of the effects of a mental health rehabilitation programme: EUROHIS-QOL scores improved significantly in a sample of adolescents and young adults over a 18-month period (33).

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Overall QOL scores did not correlate with the severity of exposure to the trauma. However, QOL scores negatively correlated with post-traumatic stress symptom severity that in turn correlated with the severity of exposure. Likewise, QOL scores negatively correlated with general psychological symptoms that also correlated with the exposure severity. In addition, previous need for mental support and previous trauma experience also correlated with QOL scores. Although chronic illness did not correlate with quality of life, worse perceived health did reduce it. When these variables were tested in multiple regression models, previous trauma experience and previous need for mental support were no longer significant. In addition, effects of post-traumatic stress symptoms on overall QOL scores faded away when general psychological symptoms were simultaneously tested. Altogether, general psychological symptoms and perceived health mainly explained the variance in overall QOL. This may indicate that trauma-related depressive symptoms may be more detrimental to quality of life than PTSD symptoms alone in youth. The negative impact of comorbid depression with PTSD on quality of life has been implicated among adults (9).

Those adolescents and young adults who were recovering from post-traumatic symptoms over the two year follow-up also had an improving quality of life. Their overall QOL scores were similar to the high post-traumatic symptoms group at baseline yet similar to the low symptoms group at 28 months. Adult studies indicate that successful treatment of PTSD also improves quality of life (34).

Limitations of this study include using self-report screening scales IES-22 and the GHQ-12 that cannot be used as diagnostic instruments. We also used a selection of questions that do not capture all dimensions of QOL relevant to adolescents, especially environment and opportunities for growth (2). The sample size is considerable, but we have little information on those who were not willing to participate in the study.

In conclusion, trauma-exposed adolescents and young adults had a lower overall quality of life compared to their unexposed counterparts, but the difference was not striking. There was indication that trauma-related depressive symptoms or more general psychological symptoms may have a larger impact on quality of life than PTSD symptoms alone. When assessing youths after potentially traumatic experiences, diverse symptoms should be queried, and aspects of quality of life and functioning should be considered.

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