

## INVESTIGATIVE REPORT

# Itch, Stress and Self-efficacy Among 18-year-old Boys and Girls: A Norwegian Population-based Cross-sectional Study

Florence DALGARD<sup>1</sup>, Robert STERN<sup>2</sup>, Lars LIEN<sup>3</sup> and Stuart HAUSER<sup>4</sup>†

<sup>1</sup>Institute of Health and Society, <sup>3</sup>Institute of Psychiatry, University of Oslo, Oslo, Norway, <sup>2</sup>Beth Israel Deaconess Medical Center, and <sup>4</sup>Judge Baker Children Center, Harvard Medical School, Boston, USA

**Itch is the most common dermatological symptom and worsens with stress. The general belief of a person in their own ability to cope in stressful situations, known as self-efficacy, is relevant in the management of chronic diseases other than skin diseases. The aim of this study was to explore the association between perceived self-efficacy, itch and stress among late-stage adolescents. The study was cross-sectional and questionnaire-based. Information on psycho-social factors and skin symptoms among late adolescents was collected in a sample of the general population in Oslo, Norway. In this sample of 2,489 boys and girls, the prevalence of current itch was 7% among adolescents with high self-efficacy and low stress, and 17% among adolescents with low self-efficacy ( $p=0.028$ ). Adolescents with low self-efficacy under higher stress were twice as likely to report itch than those with high self-efficacy (30% vs. 15%,  $p=0.072$ ). In the adjusted logistic regression the report of current itch was significantly associated with low self-efficacy, with an odds ratio of 2.85 (1.71; 3.82). In conclusion, current itch was significantly associated with low self-efficacy among adolescents. Further clinical research is needed to determine whether improvement in self-efficacy could contribute positively to the management of patients with itch. Key words: stress; survey; psycho-social; adolescence.**

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Florence Dalgard, Institute of Health and Society, University of Oslo, NO-0318 Oslo, Norway. E-mail: Florence.dalgard@medisin.uio.no

Itch is the major symptom of common chronic inflammatory skin diseases such as eczema and psoriasis (1), but can also be an isolated disabling symptom. This symptom has high prevalence among both adults and adolescents (2–4). The treatment of itch is challenging for clinicians. An association of itch with depression and psychiatric disease is described among adults (5–7) and adolescents (4). Psychological factors, including isolation and psychological stress, play a significant role in the development of itch and the exacerbation of inflammatory skin diseases (5, 8–13).

Intrinsic personality factors might make the individual more vulnerable or more apt to become pruritic when faced with stressful life events. The concept of perceived self-efficacy is the belief in one's competence to cope with challenging demands. This construct was introduced by Bandura (14). There is a large body of research linking an individual's own belief in how he or she can manage difficult situations and stress. A lack of perceived control over environmental demands might influence disease outcomes (15).

A validated questionnaire, the Generalized Self-Efficacy Questionnaire, which has been translated into many languages (16, 17) is available to assess self-efficacy. Although self-efficacy has been shown to be associated with rehabilitation of chronic disease (17), there is a lack of literature exploring the connection between self-efficacy and health outcomes (14) or symptoms such as itch.

The immune system is complex and protects the body against disease bouts. Two possible activated pathways link stressful events to immunity; the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system, which result in elevation of the hormones cortisol and catecholamines. Immune cells have receptors for those hormones, activation of which results in the release of neuro-endocrine peptides (18, 19).

In an experimental study it was shown that a strengthening of perceived self-efficacy by psychotherapeutic intervention had an immuno-enhancing effect on subjects exposed to a stressor (20).

The influence of psychological stressors on health through the immune system has been described for some diseases (19, 21–23). When uncontrollable stressful events are encountered, greater self-efficacy helps to protect the individual from depression, and perhaps other somatic symptoms too (24). In adolescence in particular, coping style is part of the maturation process and helps the adolescent to face life challenges (25). As a whole the association of perceived self-efficacy and somatic disease has not been well studied.

The purpose of this study was to demonstrate the relationship of poor self-efficacy and current itch among adolescents under stress by using data from a population-based survey.

## MATERIALS AND METHODS

### *Participants and study design*

Data from a 2004 follow-up study in Oslo, Norway, collected as part of "The Youth 2004 Project," (available on: [http://www.fhi.no/eway/default.aspx?pid=238&trg=MainLeft\\_5895&MainArea\\_5811=5895:0:15,4562:1:0:0:::0:0&MainLeft\\_5895=5825:91213::1:5896:3:::0:0](http://www.fhi.no/eway/default.aspx?pid=238&trg=MainLeft_5895&MainArea_5811=5895:0:15,4562:1:0:0:::0:0&MainLeft_5895=5825:91213::1:5896:3:::0:0)) including a school-based and a postal survey, was used in the present study.

The present study is cross-sectional, based on a sample of a follow-up study of a baseline study performed in 1999–2001 in which 7,343 (88%) 15–16-year-olds participated. Of the participants in the baseline study 2,489 (65%) participated in the follow-up study. Further details and the study flow-chart are described in a recent Norwegian study (26). In the school-based survey, the students completed a 4-page questionnaire during one school class, after completing a consent form. A project assistant was present in the classroom, informing the students about the survey and administering the questionnaires. In order to enrol students who were not present at the school, the class principal received instructions and questionnaires to be distributed later to those students. If the students did not respond, a questionnaire with pre-stamped return envelope was sent to their home address. In the postal survey, invitees received packs of materials, which included an invitation letter, information brochure, consent form, questionnaire and a pre-paid return envelope. Two reminders were sent to those who did not respond. A more detailed description can be found elsewhere (available from: <http://www.fhi.no/dav/AD07555E4B.doc>). The study protocol was evaluated by the Regional Committee for Medical Research Ethics and approved by the Norwegian Data Inspectorate.

The complete questionnaire included self-reported answers on items on somatic health, mental health, lifestyle, and healthcare behaviour (available from: <http://www.fhi.no/dokumenter/7608817A0E.pdf>). The database was linked to "Statistics Norway" (the official statistical institution in Norway) for the socio-demographic information.

*Ethnicity.* Country of birth was used as a measure of ethnicity. This information came from Statistics Norway. The initial 13 categories were dichotomized into Norwegian born/non-Norwegian born.

*Socio-economic status.* Family income was represented by the sum of both parents' income before tax, and was categorized as: low income (<500,000 NOK; <65,625 EUR), middle income (500,000–1,000,000 NOK; 65,625–131,250 EUR) and high income (>1,000,000 NOK; >131,250 EUR).

*Current itch.* Current itch was a self-reported item, and is part of a newly developed skin questionnaire previously validated among adults and adolescents (27, 28) used in large population studies (5, 6, 29). The question was as follows: "Have you had itchy skin within the last week?" The possible answers were: no, yes a little, yes quite a lot, yes very much. The item on itch was dichotomized in the analysis into: no, little vs. quite a lot, very much.

### *Eczema*

Eczema was a self-reported item. The question was as follows: "Do you currently have, or have you had eczema?" The possible answers were: yes now, yes previously or no. The question on eczema was validated in a separate study among 260 18–19-year-old girls and boys (28).

*Stressful life events.* Major stressful life events were part of this questionnaire designed for adults, but all items are adapted to

address the adolescent's situation (30). The events in the adolescents' life were listed as follows: "Have you within the last year experienced any of the following? Has a parent become unemployed or qualified for disability pension? Have you been seriously ill or injured? Has someone close to you been seriously ill or injured? Has someone close to you died? Have you experienced any sexual violation (indecent exposure, pawing, unwilling rape)?" The possible answers were yes or no.

The life events variables were categorized according to the number of events: no event (low stress), one event (medium stress), two or more events (high stress). In the analysis, the life-event variable was dichotomized as no stress (no event within the last 12 months) versus stress (one or more events within the last 12 months).

*Perceived self-efficacy.* The Generalized Self-Efficacy Scale was developed by Schwarzer & Jerusalem in Germany in 1981 and has been shown to have good psychometric properties (31). It has been translated into 27 languages and is widely used (available from: <http://userpage.fu-berlin.de/~health/selfscal.htm>).

The original questionnaire consists of 10 items (17) and a 5-item General Self-Efficacy version has been developed and used previously in a large Norwegian study showing an internal consistency Cronbach's  $\alpha=0.83$  (32).

The items are as follows: "I always manage to solve serious problems if I try hard enough", "If someone opposes me, I manage to find ways and means of getting what I want", "If I have a problem and am completely stuck, I usually manage to find a way out", "I am quite sure that I would be able to tackle unexpected occurrences in an effective manner", "I stay calm when I meet difficulties because I trust my coping abilities". For each item there are 4 possible answers, from completely wrong to completely correct.

In the descriptive analysis the self-efficacy variable was dichotomized: the lowest values (1) as low-efficacy item and higher values (2–4) as highest efficacy item. The rationale for this dichotomization was that the distribution of outcome measures such as itch and depression across the 4 initial categories of self-efficacy showed that the individuals reporting the lowest value of self-efficacy were the most vulnerable. A total index was computed as the sum of the 5 items of self-efficacy divided by 5. The index was dichotomized with the lowest value (1) as low self-efficacy and the other values (2–4) as high self-efficacy.

*Depressive symptoms.* Hopkins Symptom Check List (HSCL-10) is a 10-item shortened version of the more widely used HSCL-25, an instrument that mainly measures symptoms of anxiety and depression (33). The items are as follows: "Have you in the course of the past week been troubled by feeling: sudden fear for no reason, afraid or anxious, faint or dizzy, tense and harassed, guilty, sleepless, depressed/dejected (sad), useless – of little worth, hopelessness for the future, that everything is a burden?". Each item is rated on a scale of 1 (not troubled) to 4 (very much troubled). The total score HSCL-10 was calculated and dichotomized. A score of more than 1.85 has been shown to be a valid predictor for clinical depression or anxiety among subjects aged 16–24 years (33).

### *Statistical analysis*

The aim of this study was to assess the correlation of self-efficacy with itch among adolescents. The distribution of self-efficacy, current itch, depressive symptoms, eczema and negative life events was described using cross-tabulations with  $\chi^2$  test. Logistic regression was performed following the Strobe statement (34): in the adjusted models the variables of self-efficacy, gender, eczema, depressive symptoms, stress and socioeconomic status were included stepwise. The results were reported as odds ratios (OR) for itch with 95% confidence in-

terval (CI). Concerned by the possible collinearity between the variables of depressive symptoms, stress and self-efficacy, we compared the estimated standard errors in crude and adjusted models, which can be assessed by comparing the length of unadjusted and adjusted CI. The Statistical Package for the Social Sciences SPSS version 16 was used for statistical analysis.

## RESULTS

Table I shows the population characteristics of the total sample. Among the 2,489 respondent adolescents, 45% were boys and 55% were girls. Most of the adolescents in this sample were born in Norway (87%). Just over half of the sample (54%) were of middle socio-economic status, less than one-quarter of lower status and one-quarter of higher status, as measured by annual family income.

Table II shows the distribution of the outcome measures across genders. Boys reported less difficulties in tackling unexpected occurrences (1.4% of the boys vs. 3.4% of the girls,  $p=0.003$ ). Boys stayed calmer in difficult situations (2.2% of the boys vs. 4.9% of the girls,  $p<0.001$ ). Overall, girls had significantly lower self-efficacy than boys (1.7% of the boys vs. 5.8% of the girls,  $p<0.001$ ).

The prevalence of current itch was significantly lower for boys (6%) compared with girls (11%). Girls were more often depressed than boys (13% of the boys vs. 34% of the girls,  $p<0.001$ ) and reported having or having had more eczema than boys (20% of the boys vs. 37% of the girls,  $p<0.001$ ).

In the total sample more than 24% of the adolescents had experienced a stressful life within the last year, and 62% did not report any event. Sixteen percent of the girls reported  $\geq 2$  stressful life events compared with 10% of the boys.

Table III demonstrates the association of poor self-efficacy and current itch among adolescents reporting

Table I. Population characteristics in the late adolescent sample in the Oslo Youth Study (n = 2,489)

	Total sample n (%)
Age	
17 years	68 (2.7)
18 years	2,342 (94.1)
19 years	79 (3.2)
Gender	
Girls	1,377 (55.3)
Boys	1,112 (45.7)
Ethnicity	
Norwegians (born in Norway)	2,164 (87)
Non-Norwegians	324 (13)
Socioeconomic status <sup>a</sup>	
Lower	498 (21.4)
Middle	1,261 (54.1)
Higher	573 (24.6)

<sup>a</sup>Family annual income: low <500,000 NOK; middle 500,000–1,000,000 NOK; high >1,000,000 NOK (1 EUR=7.87 NOK).

stress within the last year. The association between itch and poor self-efficacy was significant even among those without stress, and increased with stress from 16% to 30%. Adolescents with high self-efficacy have a prevalence of itch of 7% when under low stress, but under the same conditions 17% of adolescents with low self-efficacy experience itch ( $p=0.028$ ). Individuals under high stress are twice as likely to experience itch (30% vs. 15%,  $p=0.072$ ) when they have poor self-efficacy compared with those who have high self-efficacy.

Logistic regression models for itch among adolescents are shown in Table IV, first with crude OR among those without eczema, then among those with eczema, and finally in the whole sample. Poor self-efficacy was significantly associated with the report of itch, with OR 2.85 (95% CI 1.71; 4.78) in the crude model, and remained significant in the final model when adjusting for gender, eczema, depressive symptoms, negative life

Table II. Distribution of outcome measures across gender in the sample (n = 2,489)

	All		Boys		Girls	$p^d$
	n (%)	Missing, n	n (%)	n (%)		
Poor self-efficacy <sup>a</sup>						
Problem solving	55 (2.2)	6	25 (2.3)	30 (2.2)		NS
Managing to get what I want	69 (2.8)	15	24 (2.2)	45 (3.3)		NS
If stuck finding a way out	25 (1.0)	11	10 (0.9)	15 (1.1)		NS
Tackling unexpected occurrences	62 (2.5)	17	16 (1.4)	46 (3.4)		0.003
Staying calm in difficulties	91 (3.7)	17	24 (2.2)	67 (4.9)		<0.001
Low self-efficacy <sup>b</sup>	97 (3.9)	32	19 (1.7)	78 (5.8)		<0.001
Itch	220 (9.0)	36	63 (5.7)	157 (11.6)		<0.001
Depressive symptoms <sup>c</sup>	608 (24.6)	14	145 (13.1)	463 (33.8)		<0.001
Eczema now	230 (9.6)	99	71 (6.6)	159 (12.2)		<0.001
Negative life events						
None	1,545 (62.0)	–	738 (66.4)	807 (58.6)		<0.001
One	605 (24.3)		261 (23.5)	344 (25)		
Two or more	339 (13.6)		113 (10.2)	226 (16.4)		

<sup>a</sup>Lowest grade of self-efficacy item, see Methods section.

<sup>b</sup>Index of self-efficacy, lowest value defined as poor self-efficacy, see Methods section.

<sup>c</sup>Depressive symptoms measured by the Hopkins Symptom Check List, see Methods section

<sup>d</sup> $p$ -value for the significance of the differences between the genders.

Table III. Association of poor self-efficacy and current itch stratified by stress (number of negative life events) among adolescents in Oslo (n = 2,489)

	Current itch		p
	Poor efficacy n (%)	High efficacy n (%)	
Low stress <sup>a</sup>	8 (16)	101 (7)	0.028
Medium stress	58 (25)	52 (9)	0.022
High stress	6 (30)	46 (15)	0.072

<sup>a</sup>Stress defined as number of negative life events within the last year (low stress: no event; medium stress: one event; high stress: more than 2 events). Missing data from 61 subjects.

events and socioeconomic status, with OR 2.04 (95% CI 1.09; 3.82). Among those without current eczema poor self-efficacy remained significant, with OR 2.36 (95% CI 1.21; 4.63).

## DISCUSSION

This cross-sectional study introduces the concept of self-efficacy related to a major dermatological symptom. We have shown that the prevalence of current itch is more than twice as high among adolescents with low self-efficacy compared with those with high self-efficacy, and that this association increases with stress. Furthermore, the report of current itch is significantly associated with poor self-efficacy even when adjusted for other relevant confounders.

A major limitation of this cross-sectional study is that the symptom itch is self-reported. Itch is a subjective symptom with similarities to pain, in the sense that objective signs can only be proxies for the symptom. Quantifying itch precisely is difficult (35), but the prevalence of this symptom has been assessed among adults and adolescents by self-report in population surveys (5, 36). In those described population-based studies the reporting of itch is expected to refer to current itch (5).

Another limitation concerns the design: firstly, the cross-sectional design of this study, which allows us to describe associations but not the direction of causality. Secondly, although it is assumed that the adolescents

who participated are fairly similar to the non-responders, a lost to follow-up study showed that ethnic Norwegians participating after reminders had poorer mental health than those participating at baseline, but there were no statistical differences at baseline among the ethnic minorities (26). The response rate among minorities probably added a selection bias to the present study. Nevertheless, we believe that the measures of associations in our study are representative for measures of association in an urban Western youth population.

Itch is the major symptom of atopic eczema, which is the most prevalent inflammatory skin disease among adolescents (37). Although we adjusted for eczema in the regression analysis there is probably a report bias for eczema: some participants over-report minor rashes or dry skin as eczema.

Because the frequency of itch is likely to be very different among those with and without eczema, and eczema is a major explanatory factor for itch, we stratified for eczema in our analysis. Stratification allowed us to explore predictors of itch for individuals with and without eczema. We suspected that the impact of the predictors would be different for subjects with and without eczema. Not unexpectedly, among all subjects having current eczema, eczema was the most important predictor of itch, followed by depressive symptoms, stress and socioeconomic status. For those with current eczema, depressive symptoms and stress were the most important factors to explain current itch. Among adolescents without eczema, depression and low self-efficacy were the major predictors of itch.

Low self-efficacy could be interpreted as a low sense of control. The susceptibility of the individual to experience itch may be related to this poor belief in own control. Self-efficacy, as self-esteem, is particularly important in late adolescence or early adulthood, where coping style is of crucial importance for the individual's preparing to meet the adversities of life (38). The significant differences in the proportion of boys and girls who report being able to "tackle unexpected occurrences" and "stay calm in difficulties", is striking. This may reflect developmental differences in males and females,

Table IV. Logistic regression models for reporting itch among adolescents in the total sample (n = 2,489) and among those with (n = 230) and without current eczema (n = 2,190)

	Crude ORs for explanatory factors for itch			Adjusted <sup>b</sup> ORs		
	Without eczema OR (95% CI)	With eczema OR (95% CI)	All OR (95% CI)	Without eczema OR (95% CI)	With eczema OR (95% CI)	All OR (95% CI)
Poor self-efficacy	4.23 (2.33; 7.68)	1.19 (0.36; 3.89)	2.85 (1.71; 4.78)	2.36 (1.21; 4.63)	1.03 (0.27; 3.94)	2.04 (1.09; 3.82)
Gender	0.46 (0.31; 0.69)	0.72 (0.40; 1.31)	0.46 (0.34; 0.62)	0.66 (0.42; 1.03)	0.83 (0.44; 1.56)	0.70 (0.48; 1.00)
Eczema now	–	–	9.53 (6.89; 13.17)	–	–	10.30 (7.22; 14.69)
Depressive symptoms	4.07 (2.82; 5.87)	2.22 (1.26; 3.89)	3.56 (2.68; 4.73)	3.11 (2.03; 4.75)	2.07 (1.12; 3.82)	2.72 (1.92; 3.86)
Stress <sup>a</sup>	1.98 (1.27; 3.07)	2.02 (1.04; 3.91)	2.13 (1.52; 2.98)	1.36 (0.82; 2.25)	1.50 (0.74; 3.03)	1.42 (0.94; 2.14)
Socioeconomic status	1.40 (1.05; 1.88)	1.47 (0.98; 2.20)	1.36 (1.10; 1.69)	1.22 (0.92; 1.65)	1.31 (0.86; 2.01)	1.25 (0.98; 1.60)

<sup>a</sup>Stress defined as more than one negative life event during the last year, see Methods section.

<sup>b</sup>Adjusted for all variables.

OR: odds ratio; CI: confidence interval.

but also could be attributed to differences between boys and girls regarding cultural constraints.

Experimental evidence suggests that self-efficacy can be enhanced by psychotherapeutic intervention, and immunological changes that accompany such change can be measured. In an experimental study of subjects exposed to a stressor the progressive perceived self-efficacy was accompanied by a decrease in levels of cortisol, and a higher lymphocyte and helper T-cell function (20). Increased self-efficacy has been shown to be useful in the management of pain, somatic complaints and depression among adolescents (25), as well as chronic fatigue syndrome and musculoskeletal pain among adults (39, 40).

What is the relevance of self-efficacy in a dermatological context? The current study raises the possibility that strengthening the general coping ability of an individual by psychotherapeutic intervention might reduce the report of current itch, but this has not yet been demonstrated among patients.

Perceived self-efficacy is a new concept to dermatologists and might be relevant for clinicians. This population study adds to research exploring the interaction between biopsychosocial factors and biological systems, emphasizing the orientation from disease model to a health model (41).

Despite some limitations we have shown that poor self-efficacy predicts the report of current itch among adolescents and even more under stress. Further clinical research is needed to examine whether targeted psychological interventions that improve self-efficacy might have positive implications for the management of patients with itch.

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