Emotional regulation strategies as predictors of wellbeing in CYP

Technical report

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Introduction:

Local authority public health departments require information about how to assess and potentially improve children's emotional wellbeing (PHE, 2016). The Good Childhood Index (The Children's Society, 2010) is a series of emotional wellbeing measures, which later research validated (The Good Childhood report, 2016). Two separate scales measure 'subjective' happiness (H) and a more 'cognitive' life satisfaction (LS). Difficulties at home, unstable family relationships, interactions on social media, or experiences of bullying were linked to lower levels of subjective wellbeing and differences can exist between genders. Typically, individuals report high levels of wellbeing, but low resilience can cause problems should issues arise.

One form of resilience is known as Emotional Regulation, where individuals employ various coping strategies; Cognitive Reappraisal (CR; reconceptualising problems and view them more positively) and Expressive Suppression (ES; burying negative feelings and avoidance). A validated scale for identifying these was developed for children (Gullone and Taffe, 2012), involving six sub-questions for CR and four sub-questions for ES, rated on an ordinal scale.

The present study recruited 1,185 Year-6 children from 39 primary schools across West Sussex to complete a questionnaire on health and wellbeing, including the above scales and a range of other questions. There are roughly 9,500 children in this age group in West Sussex[1], so the sample *n* represents approximately 8% of the total population. Whilst participation was voluntary, the sample only included children from schools who agreed to take part in the study and there may be unknown factors influencing school participation. Independently funded schools declined to participate, so more affluent children of West Sussex (5-10%) may not be included here.

No efforts were made to stratify the sample by deprivation. Although schools can be mapped to local communities via their deprivation deciles (IMD, 2015[2]), it is not possible to know where each child lived within the school's catchment area. Postcodes from each participant could have resolved this, but this could negatively impact children's sense of anonymity. To offer some insight into deprivation, respondents were asked if their parents were in work, with neither parent in work taken to indicate a less affluent household[3]. Ethnicity and other sociodemographic questions were not asked and are not discussed in the report[4]. Geographically, efforts were made to provide an even coverage across the county, with the main urban and rural areas represented.

Information on bullying (and the type of bullying; verbal, physical, or cyber) was collected and nearly half the sample had experienced at least one of these. This has led some schools to query whether the question is being understood by the children accurately, as it conflicts with their expectations. It is possible that children were not interpreting questions affecting their wellbeing in the same way as adults reading the results, though it is argued here that if a child *feels* like they've been bullied, this could be enough to negatively impact their wellbeing and so warrants inclusion. The same is argued for other points of interpretation in this survey.

Primary variables are described below in Table 1, with secondary variables described in Appendix Table A1.

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[1] Population estimates available from jsna.westsussex.gov.uk, using ONS (2015) data.
[2] Index of Multiple Deprivation deciles are calculated by the ONS and narrow to LSOA levels (geographical areas containing approximately 1,200 residents).
[3] This holds some uncertainty, as affluent households where one parent earns a lot of money are being compared to potentially deprived households where both parents earn very little.
[4] The BAME population of 10-year olds in West Sussex is difficult to estimate, six years after the 2011 census, but populations based on ONS figures may lie between 10-15% within this age group, potentially amounting to 110-175 pupils from our sample.

Table 1: Core Variable definitions

Mean Happiness Score (H)	This variable is an arithmetic mean of ten subscales, each answered on an ordinal scale of 0-10. Sub-questions included "How happy are you with... the way you look; your family; your health" etc. (see The Good Childhood Index, 2010).
Total Life Satisfaction score (LS)	This variable is an arithmetic sum of five subscales, each answered on a five-point ordinal scale from 0-4, (strongly agree to strongly disagree), to create a range from 0-20. Sub-questions asked respondents to agree or disagree with questions about satisfaction: "my life is going well; my life is just right" (see The Good Childhood Index, 2010).
Total Cognitive Reappraisal Score (CR)	This variable is an arithmetic sum of six subscales, each answered on a five-point ordinal scale from 1-5 (strongly disagree to strongly agree) to create a range from 6-30. Sub-questions asked respondents to agree or disagree with questions about coping with problems: "When I want to feel happier, I think about something different" (see Gullone and Taffe, 2012).
Total Expressive Suppression Score (ES)	This variable is an arithmetic sum of four subscales, each answered on a five-point ordinal scale from 1-5 (strongly disagree to strongly agree) to create a range from 4-20. Sub-questions asked respondents to agree or disagree with questions about coping with problems: "I control my feelings by not showing them" (see Gullone and Taffe, 2012).

It is hoped that an analysis of these results will show a clear association between the specific emotional regulation strategies and positive emotional wellbeing outcomes. Secondary variables should provide insight into how these contribute to wellbeing, providing opportunities to identify children who may be at risk of struggling emotionally.

Methodology:

To explore these issues, the following methodology was devised:

Table 2: Research strategy employed

Ordering	Research strategy:
1.	Report the descriptive statistics for the primary and secondary variables and decide if assumptions of normal distributions can be held.
2.	Discern if the scores for the primary variables CR, ES, H and LS, differ by sex
3.	Discern if any association exists between secondary variables and sex
4.	Discern if H and LS are associated
5.	Discern if CR and ES are associated
6.	Discern if CR and ES are associated with a change in H scores
7.	Discern if CR and ES are associated with a change in LS scores
8.	Identify if any secondary variables are associated with H and LS

Due to the two-tailed nature of this analysis, statistical significance throughout was taken as $p<0.05$, unless stated otherwise:

1) Sample size; minimum and maximum ranges, mean statistics ($\bar{x}$ and SE), and distribution statistics (SD, skewness and kurtosis, with SE) are reported. SD values will be used to interpret standardised (z)variables in later regression models. Distribution statistics will dictate if primary variables are assumed to be normally distributed at the ±1.96 level for skewness and kurtosis.

2) Primary variables were split by sex to see if significant between-group differences can be identified using independent samples t-tests.
   - H_0: μ (boys)= μ (girls)
   - H_a: μ (boys)≠ μ (girls)

3) Dummy-variables for all non-binary variables were created – for later regression models[5] – and these, with existing binary variables were included in separate Chi-squared tests testing for associations with sex.
   - H_0: There is no association between the variable and sex, so that the distribution of proportions for the variable are the same for boys and girls.
   - H_a: There is an association between the variable and sex

4) Pearson's correlations tests were used to identify whether H and LS have a linear association.
   - H_0: r=0, where r is the correlation between H and LS.
   - H_a: r>0

5) Pearson's correlations tests were used to identify whether CR and ES have a linear association.
   - H_0: r=0, where r is the correlation between CR and ES.
   - H_a: r>0

6) Linear regression modelling showed if standardised CR and ES scores were associated with a linear change in standardised H scores.
   - H_0: $\beta_{CR}=0$; $\beta_{ES}=0$
   - H_a: $\beta_{CR}\neq0$; $\beta_{ES}\neq0$

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[5] SPSS outputs exclude (and calculate with reference to) the dummy-level representing the modal average for each ordinal variable. These dummy-variables are annotated under the regression tables.

An acceptable F score for the model, placed at F>3.84 (or t^2), was used to discern if the mean of squares for the model was greater than the mean of squares for the residual error.

- H_0: F<3.84, so the model is ineffective at explaining the variance in H(z).
- H_a: F>3.84, so the model is deemed effective at explaining the variance in H(z)

R^2 statistics aided in understanding how much of the variance of H was explained by the model.

7) A separate series of models were developed for LS, following the hypotheses set out above in point-6.

8) In the regression models for steps 5) and 6), significant beta scores were reported for any secondary variable shown to contribute to a change in standardised H and LS scores, respectively. Variables believed to have little predictive power were removed from the model, unless argued that it was appropriate to keep them.

1) Summary Descriptive statistics:

The primary variables all carried a skewness statistic of $<\pm1.96$, though the two wellbeing measures (H and LS) carried a $>\pm1.96$ kurtosis (Table 3). A visual inspection (Figures 1a and 1b) show the cause of this higher kurtosis is the bunching of results around the upper ranges.

Table 3: Descriptive statistics for primary variables

Variables	Data type	N	Mean		Std. Deviation	Skewness		Kurtosis	
			Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
Mean happiness score (H)	Scale (range 0-10)	1,112	8.50	0.04	1.26	-1.55	0.07	3.13	0.147
Total life satisfaction score (LS)	Scale (range 0-20)	1,128	16.85	0.10	3.37	-1.56	0.07	2.47	0.146
Cognitive reappraisal score (CR)	Scale (range 6-30)	1,086	21.72	0.16	5.40	-0.78	0.07	0.30	0.148
Expressive suppression score (ES)	Scale (range 4-20)	1,103	11.77	0.11	3.66	-0.07	0.07	-0.44	0.147

The kurtosis of (H) 2.98-3.28 and (LS) 2.32-2.62 gives doubt to the assumptions of normal distribution, though the validated research from the Children's Society suggested the majority of children tend to score highly on these wellbeing indices and these are not largely out of our initial range (±1.96). With a reasonable proportion of the true population sampled and Figures 1a/1b showing some similarity to the normal curve, particularly below the mean, the samples are believed to behave roughly as a normal distribution.

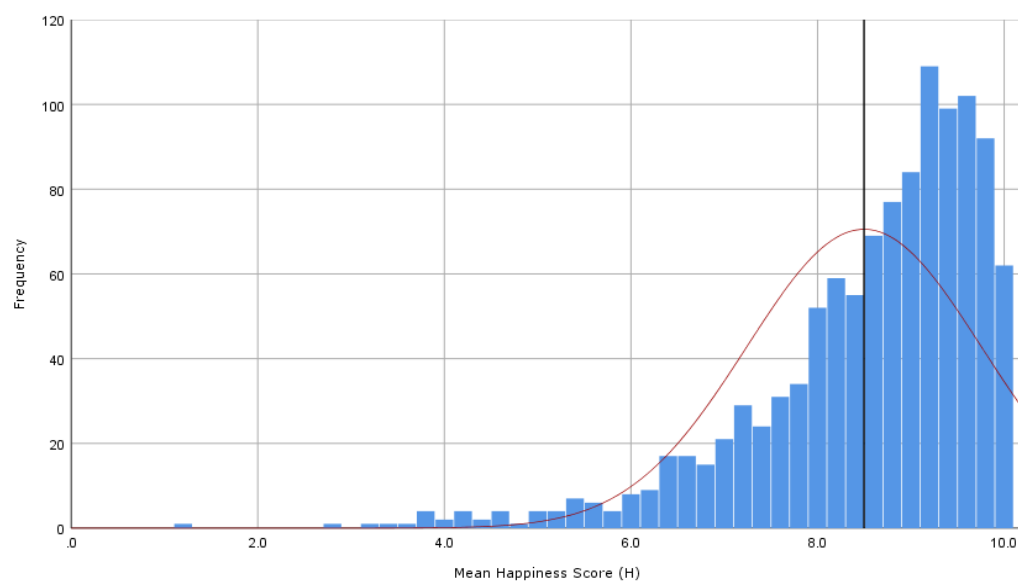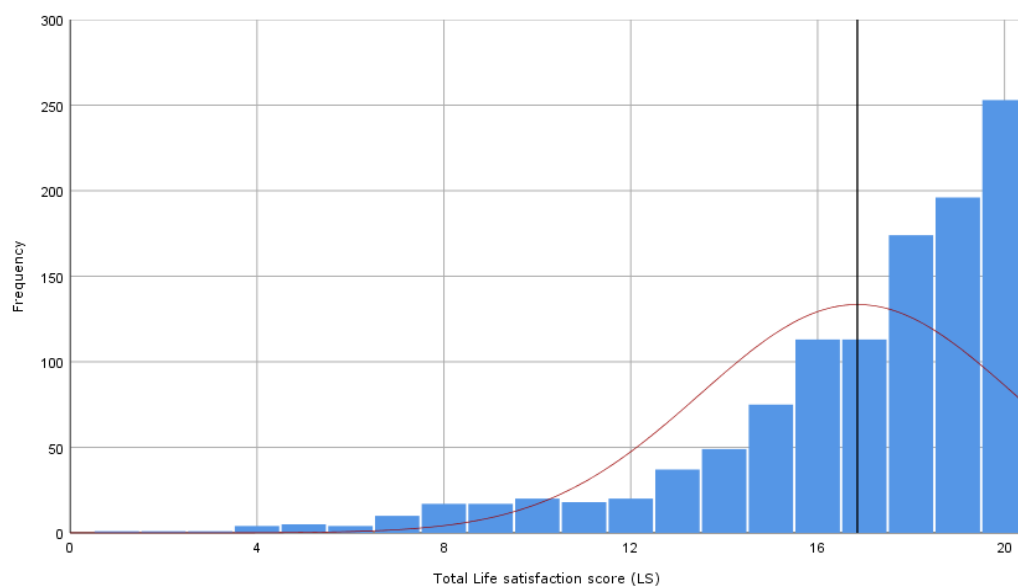Figure 1a: Mean happiness scores (H), with mean and normal curve indicated

Figure 1b: Total Life satisfaction scores (LS), with mean and normal curve indicated

2) Differences in the primary and secondary variables between boys and girls:

Differences between sexes may emerge as children grow older, though they remain similar for many indicators at age ten (The Good Childhood Report, 2016, p.27). To illustrate the similarities between sexes, frequency distributions for H are shown in Figure 2 (distributions for LS, CR and ES are alike to these). Table 4 shows descriptive statistics for primary variables split by sex.

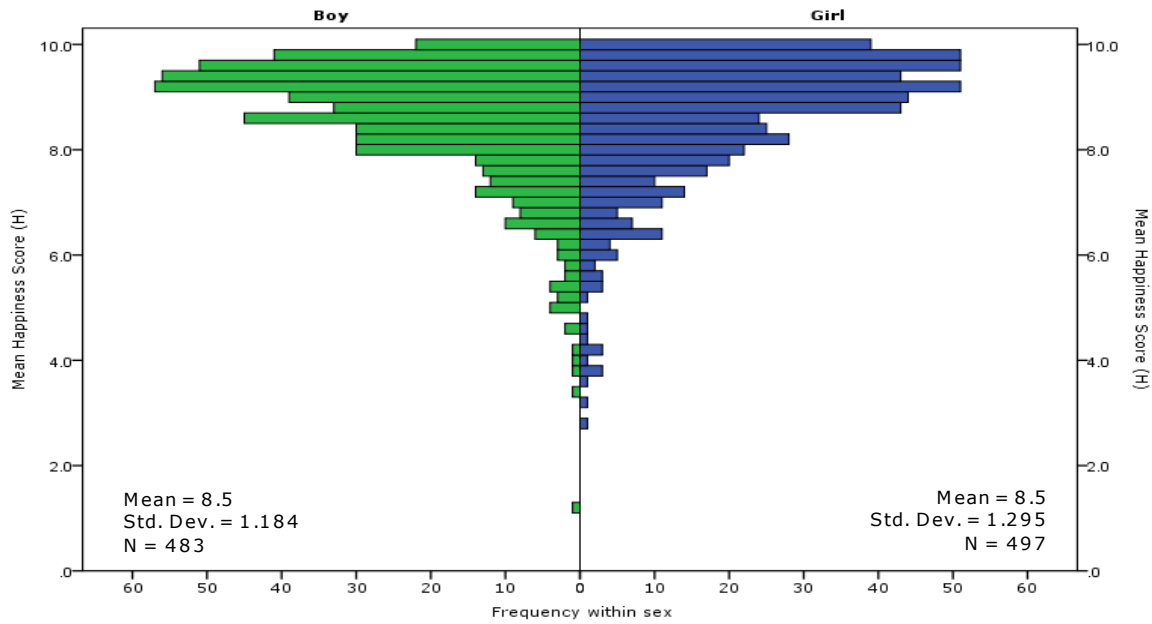Figure 1: Histograms showing H distributions for boys and girls:

Table 4: Descriptive statistics for primary variables, by sex

	Sex	N	Mean	Std. Deviation	Std. Error Mean
H score	Boy	548	8.5	1.21	0.05
	Girl	547	8.5	1.28	0.05
LS score	Boy	552	17.0	3.11	0.13
	Girl	558	16.8	3.52	0.15
CR score	Boy	538	21.7	5.36	0.23
	Girl	532	21.9	5.34	0.23
ES score	Boy	538	11.8	3.63	0.16
	Girl	548	11.6	3.68	0.16

The means for boys and girls (for each variable) differed by <0.25 SE. Independent samples t-test were run for each variable (Table 5). The Levene's test indicates that equal variances can be assumed for CR (F=0.02, p=0.88), for ES (F=0.33, p=0.57), and for H (F=2.16, p=0.14), but not for LS (F=6.20, p=0.01). However, it is possible that in large samples Levene's test can produce significant results (rejecting the null that two samples share similar variances) when variances are in fact quite similar (Field, 2013, p.195). T-test results for the primary variables showed no significant difference between sexes, (H, t=-0.25, p>0.05; LS, t=0.92, p>0.05; CR, t=-0.76, p>0.05 and ES t=0.90, p>0.05) and H_0 was rejected.

Table 5: Independent samples t-test and Levene's test for equality of variances, between sexes for primary variables H, LS, CR and ES

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | |
| | | F | Sig. | t | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
								Lower	Upper
H	Equal variances assumed	2.16	0.14	-0.25	0.81	-0.02	0.08	-0.17	0.13
	Equal variances not assumed			-0.25	0.81	-0.02	0.08	-0.17	0.13
LS	Equal variances assumed	6.20	0.01	0.92	0.36	0.18	0.20	-0.21	0.57
	Equal variances not assumed			0.92	0.36	0.18	0.20	-0.21	0.57
CR	Equal variances assumed	0.02	0.88	-0.76	0.45	-0.25	0.33	-0.89	0.39
	Equal variances not assumed			-0.76	0.45	-0.25	0.33	-0.89	0.39
ES	Equal variances assumed	0.33	0.57	0.90	0.37	0.20	0.22	-0.24	0.64
	Equal variances not assumed			0.90	0.37	0.20	0.22	-0.24	0.64

For secondary variables, Chi-squared tests were conducted against sex to see if associations could be identified (Table 6). Significant differences were found for the following: More boys had been physically bullied, more girls had been verbally bullied; more girls had a social networking account; more boys never felt lonely and more girl often felt lonely; more girls felt achievement 'sometimes'. For the other variables, H_0 was retained.

Table 6: Binary and dummy-variables for regression modelling and Chi-squared test of association with sex

|	Coded binary response	Responses			Chi-square (variable by sex)	
		Boys	Girls	All responses	X²	Sig. (p=)
Physical bullying	No	458	495	953	9.390	0.002*
	Yes	126	85	211		
Verbal bullying	No	395	328	723	15.195	0.000*
	Yes	189	252	441		
Cyber bullying	No	549	540	1089	0.394	0.530
	Yes	35	40	75		
Talk to adults if you have problems	No	154	130	284	2.701	0.100
	Yes	416	440	856		
Have a social networking account	No	264	193	457	23.759	0.000*
	Yes	288	382	670		
Family = Both parents	No	131	150	281	2.064	0.151
	Yes	450	423	873		
Family = Parent and step-parent	No	526	508	1034	1.091	0.296
	Yes	55	65	120		
Family = One parent	No	512	493	1005	1.116	0.291
	Yes	69	80	149		
Family = Carer(s)	No	574	568	1142	0.309	0.578
	Yes	7	5	12		
Parental employment = Both	No	132	140	272	0.407	0.523
	Yes	443	430	873		
Parental employment = One	No	452	440	892	0.333	0.564
	Yes	123	130	253		
Parental employment = Neither	No	566	560	1126	0.063	0.802
	Yes	9	10	19		
Argue with parents = Never	No	428	451	889	0.582	0.445
	Yes	130	120	250		
Argue with parents = Sometimes	No	181	162	343	1.653	0.199
	Yes	387	409	796		
Argue with parents = Often	No	517	529	1046	1.001	0.317
	Yes	51	42	93		
Feel lonely = Never	No	351	408	759	12.175	0.000*
	Yes	219	164	383		
Feel lonely = Sometimes	No	279	255	534	2.187	0.139
	Yes	291	317	608		
Feel lonely = Often	No	510	481	991	7.209	0.007*
	Yes	60	91	151		
Feel sad = Never	No	530	539	1069	0.989	0.320
	Yes	39	31	70		
Feel sad = Sometimes	No	121	128	249	0.236	0.627
	Yes	448	442	890		
Feel sad = Often	No	487	473	960	1.460	0.227
	Yes	82	97	179		
Sense of achievement = Never	No	554	556	1110	1.600	0.206
	Yes	7	3	10		
Sense of achievement = Rarely	No	493	509	1002	2.998	0.083
	Yes	68	50	118		
Sense of achievement = Sometimes	No	366	328	694	5.119	0.024*
	Yes	195	231	426		
Sense of achievement = Often	No	354	349	703	0.540	0.817
	Yes	207	210	417		
Sense of achievement = Very Often	No	477	494	971	2.717	0.099
	Yes	84	65	149		

* significance reported at (p<0.05)

4) Correlations between H and LS

The Pearson's correlation test was performed to ascertain if H and LS scores were associated (Table 7). There was a strong correlation ($r=0.715$, $p<0.05$), so H_0 was rejected. For this reason, each variable was not included in the subsequent regression models of the other. Correlations are represented visually in Figure 3.

Table 7: Pearson's correlation coefficient test, for H and LS

		Mean Happiness (H)	Total life satisfaction (LS)
Mean Happiness (H)	Pearson Correlation	1.000	0.715
	Sig. (2-tailed)		<.000
	N	1112	1080
Total life satisfaction (LS)	Pearson Correlation	0.715	1.000
	Sig. (2-tailed)	<.000	
	N	1080	1128

Figure 3: Scatter plot of H and LS scores, with R^2
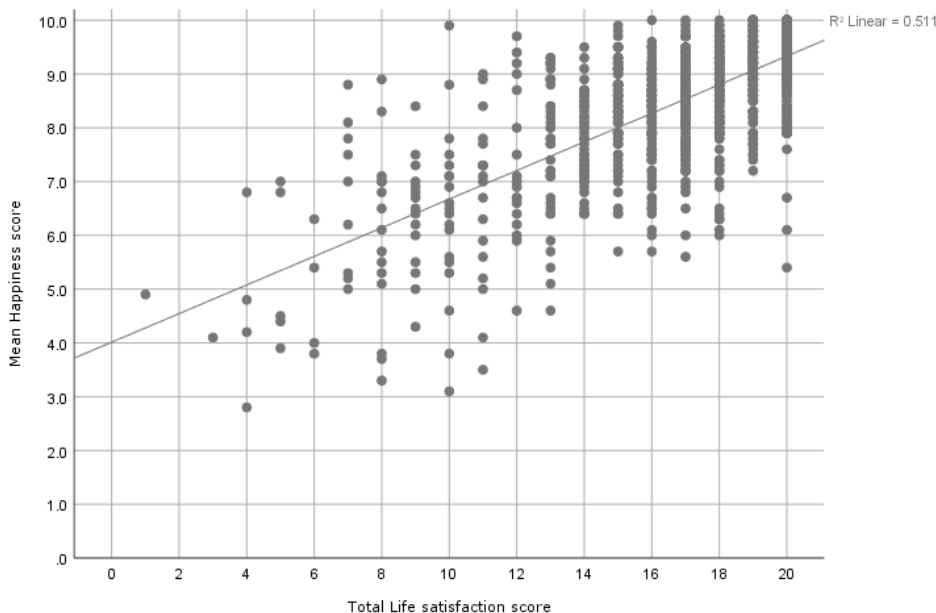

5) Correlations between CR and ES

As these two very different emotional regulation strategies are measures separately it was necessary to determine any association they may have (Table 8). The small association ($r=0.104$, $p<0.05$) is represented visually in Figure 4 and H_0 was rejected.[6]

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[6] To aid the understanding of the relationship between CR and ES scores, each observation (i) was ranked by ES scores (ascending from 4-20), with the respondent's CR scores summed with each ES score (n=1,056). This figure shows a full distribution of ES scores, for each attainable CR score, suggesting that ES and CR do not exist relative to each other; had they been (negatively) correlated, one would expect to see some decrease in ES scores for each increase in CR score (Appendix; Figure A1).

Table 8: Pearson's correlation coefficient test, for CR and ES

		Cognitive reappraisal (CR)	Expressive suppression (ES)
Cognitive reappraisal (CR)	Pearson Correlation	1.000	0.104
	Sig. (2-tailed)		0.001
	N	1086	1056
Expressive suppression (ES)	Pearson Correlation	0.104	1.000
	Sig. (2-tailed)	0.001	
	N	1056	1103

Figure 4: Scatter plot of CR and ES scores, with R^2
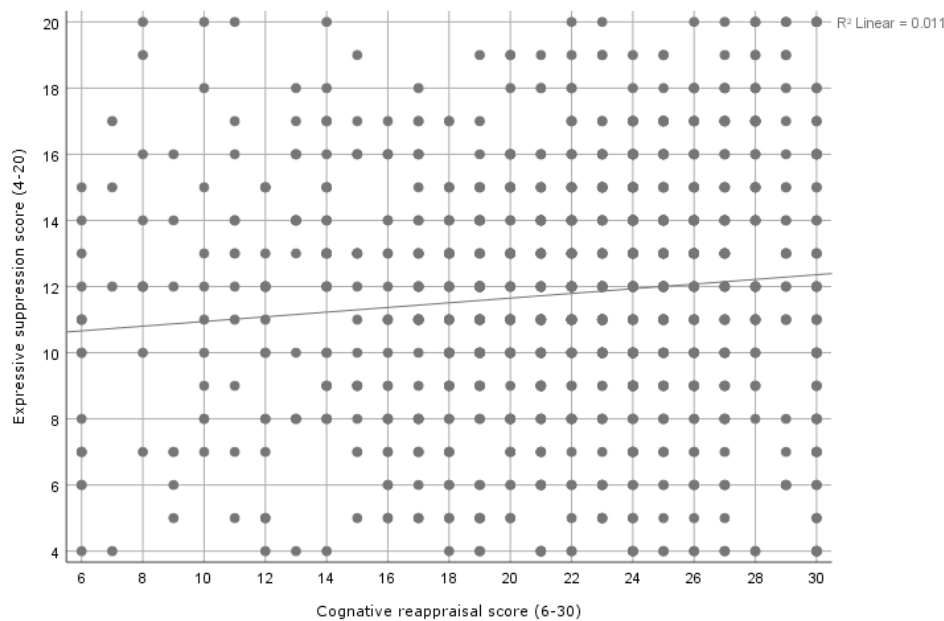
It is possible, whilst CR and ES are measuring different phenomena, that some of their variance is explained by unknown factors common to both. To explore this a simple linear regression model was conducted. With dependent variable, CR, and independent variable, ES, the model showed an adjusted R^2=0.01, with an ANOVA reporting a significant effect size, [$F(1, 1054)$=11.64, $p<0.05$] and a standardised beta coefficient of 0.104 ($p<0.05$). We can then infer that CR and ES scores alone account for very little (1%) of the change in each other and may be explained by other factors intrinsic to them both.[7]

6) Linear regression modelling for Happiness

A series of models were developed, to identify the variables associated with a change in H scores. Three important assumptions about the variables used in this approach were confirmed previously; that scale data are normally distributed; that the data display a linear function; the data do not carry excessive outliers. The primary variables were standardised in SPSS with the formula: $z = \frac{X - \mu}{\sigma}$, creating new (z)variables (Table 9) for use in the models.

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[7] For contrast, the same regression model was run for dependent variable, H, and independent variable, LS, and the adjusted R^2=0.511, suggests that LS scores alone explained 51% of the variance in H scores.

Table 9: Descriptive statistics for standardised variables (z):

Variables	N	Min*	Max*	Mean		Std. Deviation	Skewness	
				Statistic	Std. Error	Statistic	Statistic	Std. Error
H (z)	1,112	-5.80	1.19	0.00	0.03	1.00	-1.55	0.07
LS (z)	1,128	-4.70	0.93	0.00	0.03	1.00	-1.56	0.07
CR (z)	1,086	-2.91	1.53	0.00	0.03	1.00	-0.78	0.07
ES (z)	1,103	-2.12	2.25	0.00	0.03	1.00	-0.07	0.07

To gauge the effect of the primary variables, CR(z) and ES(z), on H(z) scores, a model was run with just these two in place. Model I (Table 10) shows that for predicting H(z), both CR(z) (B=.456, SE=.028 p<0.01) and ES(z) (B=-.171, SE=.028, p<0.01) were significant predictors. The overall model fit (R^2=.221, $F_{(2, 1016)}$=145.72, p<0.05) was low enough to provide rationale for the secondary variables, to reduce residual error.

Table 10: Linear regression models for Happiness (H; standardised z scores)[8]

	Model I $B=x(***)$ (SE)	Model II $B=x(***)$ (SE)	Model III $B=x(***)$ (SE)	Model IV $B=x(***)$ (SE)	Model V $B=x(***)$ (SE)	Model VI $B=x(***)$ (SE)
Intercept (constant)	-.022 (.028)	.865*** (.200)	.831*** (.198)	.754*** (.185)	.693*** (.178)	.786*** (.169)
Cognitive Reappraisal (z)	.465*** (.028)	.224*** (.027)	.228*** (.027)	.232*** (.027)	.234*** (.027)	.238*** (.026)
Expressive Suppression (z)	-.171*** (.028)	-.068*** (.025)	-.068*** (.025)	-.067*** (.025)	-.068*** (.025)	-.069*** (.025)
Sex		.100** (.050)	.099** (.050)	.079 (.048)	.086* (.048)	
Physical bullying		-0.91 (.066)	-.083 (.065)	-.077 (.064)		
Verbal bullying		-.119** (.053)	-.123** (.053)	-.136*** (.052)	-.145*** (.051)	-.132*** (.050)
Cyber bullying		-.249** (.102)	-.244** (.102)	-.281*** (.099)	-.302*** (.098)	-.287*** (.097)
Talk to adults if have problems		.102 (.063)	.106* (.063)	.119* (.062)	.118* (.061)	.120** (.061)
Have a social networking account		-.087* (.051)	-.082 (.051)			
Family = Parent and step-parent		-.180** (.081)	-.182** (.080)	-.194** (.077)	-.193** (.077)	-.193** (.076)
Family = One parent		-.275*** (.249)	-.296*** (.075)	-.318*** (.074)	-.322*** (.074)	-.324*** (.073)
Family = Carer(s)		-.705*** (.249)	-.729*** (.248)	-.766*** (.247)	-.766*** (.247)	-.769*** (.247)
Parental employment = One		-.064 (.061)				
Parental employment = Neither		-.226 (.226)				
Argue with parents = Never		.156** (.061)	.149** (.060)	.141** (.059)	.140** (.059)	.139** (.059)
Argue with parents = Often		-.291*** (.092)	-.303*** (.091)	-.290*** (.090)	-.297*** (.090)	-.309*** (.089)
Feel lonely = Sometimes		-.220*** (.056)	-.223*** (.056)	-.216*** (.055)	-.217*** (.055)	-.216*** (.055)
Feel lonely = Often		-.645*** (.095)	-.664*** (.094)	-.622*** (.093)	-.633*** (.092)	-.628*** (.090)
Feel sad = Never		0.58 (.118)	.055 (.117)	.043 (.116)	.035 (.116)	.028 (.116)
Feel sad = Often		-.468*** (.077)	-.474*** (.076)	-.447*** (.074)	-.450*** (.074)	-.465*** (.073)
Sense of achievement = Never		-.201 (.306)	-.169 (.306)	-.341 (.286)	-.340 (.286)	-.311 (.267)
Sense of achievement = Rarely		-.791*** (.089)	-.768*** (.088)	-.768*** (.087)	-.768*** (.087)	-.754*** (.087)
Sense of achievement = Sometimes		-.290*** (.056)	-.287*** (.056)	-.284*** (.055)	-.286*** (.055)	-.285*** (.054)
Sense of achievement = Very Often		.094 (.077)	.099 (.076)	.100 (.075)	.097 (.075)	.087 (.075)
R² (SE)	**.221** (.890)	**.481** (.725)	**.483** (.726)	**.479** (.726)	**.479** (.726)	**.483** (.725)
ANOVA, F DF (Regression, Residual)	**145.72*** (2, 1016)	**38.36*** (23, 904)	**42.79*** (21,918)	**45.37*** (20, 946)	**47.66*** (19, 947)	**51.86*** (18, 960)

*** significant at p<0.01; **significant at p<0.05; * significant at p<0.10

Model VI was the first to include only significant predictors (p<0.05), except for those dummy variables with very small samples numbers and explained 48% of the variance in H(z), (R^2=.483, F(18, 960)=51.86, p<0.01). In this model, CR(z) and ES(Z) both significantly predicted H(z) scores (B=.238, SE=.026, p<0.01; B=-.069, SE=.025, p<0.01) and the null was rejected.

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[8] Dummy-variables represent the effect of change from the default positions (modal average): Family=Both parents; Parental employment=Both; Argue with parents=Sometimes; Feel lonely=Never; Feel sad=Sometimes; Sense of achievement=Often

7) Linear regression modelling for Life satisfaction

Table 11 shows the results of the linear regression models for dependent variable LS(z). Model I shows that, without other variables, CR(z) (B=.349, SE=.029, p<0.01) and ES(z) (B=-.143, SE=.030, p<0.01) were both significant predictors of LS(z). The overall model fit (R^2=.129, F(2, 1025)=76.86, p<0.01) was low enough to provide rationale for the secondary variables, to reduce residual error.

Table 11: Linear regression models for Life satisfaction (LS, standardised z scores)

	Model I B=x(***) (SE)	Model II B=x(***) (SE)	Model III B=x(***) (SE)	Model IV B=x(***) (SE)	Model V B=x(***) (SE)
Intercept (constant)	-.022 (.029)	.827*** (.221)	.851*** (.204)	-.052 (.153)	.469*** (.156)
Cognitive Reappraisal (z)	.349*** (.030)	.140*** (.030)	.134*** (.030)	.138*** (.030)	.144*** (.030)
Expressive Suppression (z)	-.143*** (.030)	-.055** (.028)	-.056** (.028)	-.056** (.028)	-.055** (.028)
Sex		.015 (.055)			.017 (.054)
Physical bullying		-.085 (.072)	-.090 (.072)		
Verbal bullying		-.034 (.058)	-.018 (.058)		
Cyber bullying		-.185* (.110)	-.182 (.111)		
Talk to adults if have problems		.182*** (.069)	.173** (.069)	.167** (.069)	.175** (.069)
Have a social networking account		-.106* (.056)	-.090 (.056)	-.103* (.055)	-.120** (.056)
Family = Parent and step-parent		-.063 (.089)	-.085 (.089)	-.092 (.089)	-.069 (.089)
Family = One parent		-.275*** (.085)	-.304*** (.086)	-.318*** (.086)	-.290*** (.085)
Family = Carer(s)		-.714*** (.276)	-.721*** (.279)	-.699** (.279)	-.688** (.276)
Parental employment = One		-.113* (.067)	-.124* (.068)	-.123* (.067)	-.112* (.067)
Parental employment = Neither		.069 (.239)	.075 (.242)	.087 (.241)	.076 (.239)
Argue with parents = Never		.158** (.067)	.169** (.068)	.177*** (.068)	.166** (.067)
Argue with parents = Often		-.381*** (.102)	.359*** (.103)	-.372*** (.103)	-.393*** (.102)
Feel lonely = Sometimes		-.216*** (.062)	-.221*** (.062)	-.233*** (.061)	-.230*** (.061)
Feel lonely = Often		-.566*** (.103)	-.587*** (.102)	-.616*** (.100)	-.601*** (.101)
Feel sad = Never		.062 (.132)	.058 (.133)	.021 (.132)	.026 (.131)
Feel sad = Often		-.562*** (.084)	-.553*** (.084)	-.567*** (.083)	-.579*** (.083)
Sense of achievement = Never		.250 (.337)	.279 (.317)	.291 (.317)	.255 (.337)
Sense of achievement = Rarely		-.429*** (.097)	-.432*** (.097)	-.449*** (.097)	-.466*** (.097)
Sense of achievement = Sometimes		-.180*** (.062)	-.190*** (.062)	-.189*** (.062)	-.179*** (.062)
Sense of achievement = Very Often		.149* (.085)	.153* (.086)	.152* (.086)	.148* (.085)
Adjusted R2 (SE)	**.129** (.943)	**.358** (.803)	**.354** (.812)	**.353** (.813)	**.357** (.804)
ANOVA, F DF (Regression, Residual)	**76.86***** (2, 1025)	**23.74***** (23, 913)	**24.64***** (22, 925)	**28.19***** (19, 928)	**26.96***** (20, 916)

*** significant at p<0.01; ** significant at p<0.05; * significant at p<0.10

Model V was chosen as the final model, despite including some non-significant variables ($p>0.10$) such as sex and explained 36% of the variance in H(z), ($R^2=0.357$, $F(20, 916)=26.96$, $p<0.01$). Controlling for sex in the model meant that social networking accounts, (which are held by significantly more girls than boys) became a significant predictor ($p<0.05$). In this model, CR(z) and ES(Z) significantly predicted LS(z) levels (B=.144, SE=.030, $p<0.01$; B=-.055, SE=.028, $p<0.05$) and the null was rejected.

8) Secondary variables and discussion:

Bullying variables showed the most consistent lack of effect, despite expectations of causal relationships with happiness and life satisfaction. Physical bullying, in particular, held no significance, even when controlling for sex (significantly more boys had experienced physical bullying that girls).

The removal of sex in model VI for H(z) did not negatively affect the predictive value of the model (R^2(V)=.479; R^2(VI)=.483) and did not result in other control variables becoming more significant, as it did for LS(z). It is assumed then that sex is not a significant predictor of Happiness or Life Satisfaction in this cohort ($p<0.05$), but behaviours which differ between sexes may be reliable predictors. The strongest predictors of H(z) and LS(z) are ranked in Tables 12a and 12b.

Table 12a: The strongest predictors of H(z)

Secondary variable	Model VI results
1) rarely having a sense of achievement (as opposed to often)	B=-.754, SE=.087, p<0.01)
2) feeling lonely often (as opposed to never)	B=-.628, SE=.090, p<0.01)
3) feeling sad often (as opposed to occasionally)	B=-.465, SE=.073, p<0.01)
4) living with carers (as opposed to both parents)	B=-.769, SE=.247, p<0.01)
5) living with one parent (as opposed to both parents)	B=-.324, SE=.073, p<0.01)
6) often arguing with parents (as opposed to occasionally)	B=-.309, SE=.089, p<0.01)

That living with carers was a significant predictor with such high Beta values, despite very low sample numbers (n=12) should not be understated. Also, whilst it is not surprising that feeling sad 'often' was significant, feeling sad 'never' was not significant and so these variables should not be dismissed as obviously akin to Happiness.

Table 12b: The strongest predictors of LS(z)

Secondary variable	Model V results
1) feeling lonely often (as opposed to never)	B=-.601, SE=.101, p<0.01)
2) feeling sad often (as opposed to occasionally)	B=-.579, SE=.083, p<0.01)
3) rarely having a sense of achievement (as opposed to often)	B=-.466, SE=.097, p<0.01)
4) living with carers (as opposed to both parents)	B=-.688, SE=.276, p<0.05)
5) often arguing with parents (as opposed to occasionally)	B=-.393, SE=.102, p<0.01)
6) living with one parent (as opposed to both parents)	B=-.290, SE=.085, p<0.01)

That the top six predictors were the same for both H(z) and LS (z) warrants further investigation and from this study it is clear that family relationships and social connectivity are essential for children's emotional wellbeing. Also, the largest effects were found in negative directions, either by the variables studied, or in validating the Children Society's findings, that children tend towards positivity, unless disrupted. Other lifestyle factors available through survey research may help explain more of the residual error in the linear regression modelling, such as diet, exercise, health and weight. These can be explored in subsequent studies alongside significant predictors identified here.

Conclusion:

Both Cognitive reappraisal and (to a lesser extent) Expressive suppression scores were found to be significant predictors of children's Happiness and Life Satisfaction scores. Other test variables, including living environments and family stability were also shown to be significant. These findings can be used to develop further research into targeted commissioning solutions for young children, including focused qualitative work and targeted surveys with other age groups, to further identify vulnerable groups and likely protective factors.

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APPENDIX:

Table A1: Secondary Variables definitions

Sex	This variable is a single question which asks, "Are you…". It has three possible responses: A boy, A girl, prefer not to say. Those who answered with 'Prefer not to say' were excluded from sex-related analysis.
Bulling	This variable is a single question which asks, "If you have been bullied in the past year, what was the type of bullying?". It is answered on a check-box list including responses: Physical – someone hit or pushed you; Verbal – someone said something hurtful to you; Cyber – someone put something hurtful online or in a text message about you. Each response was coded individually and as such, some children gave multiple responses.
Talk to adults if have problems	This variable is a single question which asks, "Do you ever talk to your parents or teachers if you have any problems or worries?". It is a binary question with responses of either no or yes and is coded as 1-2.
Have a social networking accourt	This variable is a single question which asks, "Do you have a social networking account such as Facebook, Instagram, Twitter, What's App or Snapchat?" It is a binary question with responses of either no or yes and is coded as 1-2.
Family arrangement	This variable is a single question which asks, "Who lives at home with you?". It has four possible responses: Both my parents; One parent and a step parent; One parent; A carer or carers and is coded as 1-4.
Parental employment	This variable is a single question which asks, "Which of your parents/carers works?" It has three possible responses: Both my parents/carers work; One of my parents/carers works; Neither of my parents/carers work and is coded as 1-3.
Argue with parents	This variable is a single question which asks, "Do you ever argue with your parents?". It is answered on an ordinal scale: Never, Sometimes, Often and is coded afterwards in order of 1-3.
Loneliness	This variable is a single question which asks, "Do you ever feel lonely?". It is answered on an ordinal scale: Never, Sometimes, Often and is coded afterwards in order of 1-3.
Feeling sad	This variable is a single question which asks, "Do you ever feel sad?". It is answered on an ordinal scale: Never, Sometimes, Often and is coded afterwards in order of 1-3.
Sense of achievement	This variable is a single question which asks, "How often do you do something that gives you a sense of achievement?". It is answered on an ordinal scale: Never, Rarely, Sometimes, Often, Very Often and is coded afterwards in order of 1-5.

Figure A1: Individual CR and ES scores for each child, ranked by ascending CR and ES score (n=1,056)

Summed ES and CR scores (range: 10-50)

Observations (i), ranked by CR and ES scores

ES scores (range 4-20) CR scores (range 6-30)