



Self-esteem and Social Media Dependency: a Structural Equation Modelling Approach to Comparing Primary Welsh and Non-Welsh Speakers

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Abstract

The current study examined the impact of using social media in English on associations between social media dependency and self-esteem, depression, social anxiety, and loneliness for Welsh speakers. A total of 836 pupils (317 Welsh speakers; 519 non-Welsh speakers), with a mean age of 13.44 ($\pm .943$), attending state-maintained Welsh/bilingual-medium secondary schools throughout Wales, completed scales on social media dependency, self-esteem, depression, social anxiety, and loneliness. A structural equation model approach found that whenever social media dependency was the predictor, its hypothesized associations with depression, loneliness, social anxiety, and self-esteem were stronger for Welsh speakers relative to non-Welsh speakers. The results suggest that a perceived or actual marginalization of a minority language within the social media domain might negatively impact minority language speakers' self-esteem levels, which potentially impacts related psychological constructs.

Keywords Self-esteem · Social media dependency · Welsh language

Emerging as a concept over forty years ago (Bourhis et al., 2019), ethnolinguistic vitality explores how minority linguistic communities maintain their vitality within majority linguistic settings (Bourhis et al., 2019; Kuipers-Zandberg & Kircher, 2020). To determine the ethnolinguistic vitality of a language, it is necessary to appraise an array of objective and subjective indicators, which collectively might

Highlight

• Marginalization of a minority language within the social media domain might negatively impact minority language speakers' self-esteem levels, which potentially impacts related psychological constructs.

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be termed the three-factor ethnolinguistic vitality model comprising demographic, institutional, and social status factors (Giles et al., 1977). With explicit reference to the Welsh language, the three components are summarized briefly below.

Demographic factors reference the absolute quantity and distribution of members within a group, with a greater quantity suggesting greater vitality (Giles et al., 1977). Approximately just over one-quarter of the Welsh population expressed an ability to communicate in Welsh (Welsh Government, 2021a). Census data (ONS, 2011) suggests an unequal geographic distribution of Welsh speakers, who are primarily concentrated in the northern and western areas of Wales. The vitality of the Welsh language has suffered an additional detriment in the form of Welsh-speaking youth migration (Welsh Government, 2012; Welsh Government, 2017).

Institutional control factors reference the extent to which ethnolinguistic groups have attained both formal and informal representation at the community, regional, and national levels. Informal control references the extent to which a given minority group has organized its members as a pressure group, e.g. the Welsh Language Society (Cymdeithas yr Iaith Gymraeg, 2021). Formal support references the extent to which members of a minority group have attained positions of power within, for instance, regional and governmental offices, industry, the mass media, religious, and cultural institutions (Giles et al., 1977; Harwood et al., 1994). The Welsh language enjoys support at the highest level within Welsh Government (Welsh Government, 2021b). The Welsh language is also represented within television and radio (e.g. BBC Cymru, 2021; S4C, 2021); conventional journalism (e.g. Cymro, 2021; Dinesydd, 2021; Golwg 360, 2021); the ‘arts’ (e.g. Arts Council of Wales, 2021; National Eisteddfod, 2021; Urdd, 2021); education at primary, secondary, and higher education levels (e.g. Welsh Government, 2021c; Prifysgol Abertawe, 2020); and theology (Yr Eglwys yng Nghymru, 2021). Evidence suggesting Welsh-English parity within the private sector, though, is rather more sporadic (Bangor University, 2011; Welsh Government, 2020).

Ethnolinguistic minority groups that have attained a degree of institutional control are likely to enjoy enhanced social status (Harwood et al., 1994), and this has been suggested by the European Commission (EURYDICE, 2020) with respect to the Welsh language.

Subjective perceptions regarding an ethnolinguistic group’s vitality are no less important (Giles et al., 1977). From a symbolic perspective, Welsh speakers might, for instance, perceive broader linguistic equality in the form of bilingual road signs (Bourhis & Landry, 2012).

Application of the three-factor vitality model to the contemporary Welsh language landscape suggests that the language has been incorporated within many aspects of people’s everyday lived experiences, although utilization of Welsh within the private sector remains imperfect. Although the three-factor model was devised before the Internet revolution, acknowledging the widespread impact of the Internet and social media upon people’s lives (e.g. Allen et al., 2014; O’Keefe & Clarke-Pearson, 2011; Smart Social, 2020; YouGov, 2019), a ‘fourth’ component might be added to the vitality model, whereby ethnolinguistic minority groups are assessed

in terms of online representation and active usage, i.e. the vitality of minority languages within the digital sphere.

It has been estimated that at least twenty-one European languages were considered in danger of becoming digitally extinct, including Welsh (Welsh Government, 2018). Cunliffe et al. (2013) suggested that social media plays a role in the formation of individuals' attitudes towards Welsh and English languages. Despite the threat posed by dominant languages, Honeycutt and Cunliffe (2010) found numerous active Welsh language-oriented Facebook groups retaining a relatively healthy number of members, and Keegan et al. (2015) similarly observed a significant Welsh language presence within social media.

Such online usage in Welsh often requires the adoption of many English words (Cunliffe, 2019; Cunliffe & Harries, 2007). If the dominant language has a greater quantity of active participants, members of the minority group often feel compelled to communicate using the majority language (Crystal, 2000; Cunliffe, 2007). Cunliffe et al. (2013) indicated participants using a particular language within a particular social group (often the case given Welsh-medium education) tended to use that language during both on- and offline communications with that group. However, Welsh-English bilingual participants were more likely to use English during online communications (see also Honeycutt & Cunliffe, 2010). Cunliffe et al. (2013) noted that although Welsh speakers were active in social media, this did not translate into online Welsh language dominance, with a similar number adopting purely English, purely Welsh, or a mixture on Facebook, with around 40% of first-language Welsh speakers switching to English on Facebook (see also McAllister et al., 2013). Cunliffe et al. (2013) and Nguyen et al. (2015) suggested that choice of online language was influenced by offline social networks, as well as by their linguistic confidence. Whilst there are opportunities for online Welsh usage, bilinguals do not always take advantage of them (Cunliffe, 2019), suggesting the digital-vitality of the Welsh language might be weaker than the original three-factor model, above, would imply (Giles et al., 1977).

Beyond the impacts on the usage of Welsh online, actual or perceived threats against an individual's cultural and linguistic identity can negatively impact self-esteem (Baker, 1996; Brandt, 1988). Whenever Welsh-language speakers perceive a lack of opportunity to use Welsh within social media, this might transmit negative messages concerning societal regard for the Welsh language. As Welsh speakers do not invariably make use of the Welsh language on social media (Honeycutt & Cunliffe, 2010), primary Welsh speakers' non-use of Welsh online might be considered an assimilative response (Crystal, 2000), transmitting negative messages regarding the value of their primary language (Baker, 1996; Brandt, 1988). Perceiving societal devaluation of the language and, ergo, community, family, and sense-of-self, individuals' self-esteem may accordingly suffer. As suggested by previous studies (Blachnio et al., 2016; de Cock et al., 2014; Kuss & Griffiths, 2011), diminished self-esteem has been associated with an elevated risk of developing social media dependency.

In addition to the predicted impact of social media usage on self-esteem, there are empirically supported negative associations between self-esteem and each of depression (Orth et al., 2008, Orth et al., 2009, Orth et al., 2014), loneliness (McWhirter, 1997; McWhirter et al., 2002; Rosenberg, 1965), and social anxiety (de Jong et al., 2012; McCarroll et al., 2009; Obeid et al., 2013). Additionally,

there are positive associations between social media dependency and depression (Andreassen, 2015; de Cock et al., 2014; Koc & Gulyagci, 2013), loneliness (Martila et al., 2021; Shettar et al., 2017; van den Eijnden et al., 2016), and social anxiety (Lee-Won et al., 2015; Zsido et al., 2021).

The aim of the study was to compare Welsh and non-Welsh speakers along seven specific paths with a view to establishing whether primary Welsh speakers retained the stronger inter-variable association for each of the tested paths.

Given the above empirically supported associations, the following model has been hypothesized (see Fig. 1), with the clear predictions, based on ethnolinguistic vitality, that the strength of the associations will be greater for primary Welsh speakers. To the best of our knowledge, the proposed model has never been tested within a linguistic comparative context. In terms of the model's construct, as indicated previously, the tested variables have demonstrated empirically supported associations with one another, with each retaining relevance to the adolescent school population. Comparing Welsh and non-Welsh speakers' responses for each path depicted within Fig. 1, the selected valid and reliable scales (described below) facilitate hypotheses testing.

The following hypotheses are tested:

- H1: The negative association between social media dependency and self-esteem would be stronger for primary Welsh speakers.
- H2: The negative association between depression and self-esteem would be stronger for primary Welsh speakers.

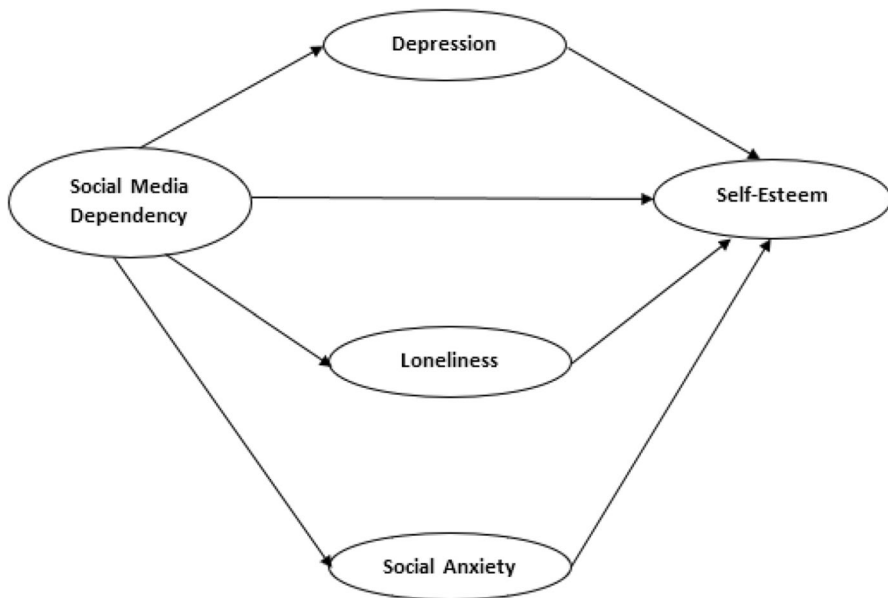


Fig. 1. Structural equation model

- H3: The positive association between social media dependency and depression would be stronger for primary Welsh speakers.
- H4: The negative association between loneliness and self-esteem would be stronger for primary Welsh speakers.
- H5: The positive association between social media dependency and loneliness would be stronger for primary Welsh speakers.
- H6: The negative association between social anxiety and self-esteem would be stronger for primary Welsh speakers.
- H7: The positive association between social media dependency and social anxiety would be stronger for primary Welsh speakers.

Method

Participants

The inclusion criteria were that pupils must attend a Welsh/bilingual-medium secondary school in Wales, be aged 12 years or over, and have read, understood, signed, and dated the consent form. Exclusion criteria were that the participant declined participation, withdrew during questionnaire completion, or the participant's school elected to withdraw from the research. Welsh/bilingual-medium schools received 1397 questionnaires and returned 844 completed forms (60.4%). Eight participants were removed as they failed to indicate primary language spoken, which resulted in a final overall total of 836 participants. There were 317 primary Welsh speakers (males = 160; females = 157) and 519 primary speakers of English and 'other' languages (males = 243; females = 276). G*Power calculations were executed for a two-tailed, small effect size ($f^2 = 0.25$), with an α error probability of $p < 0.05$, 95% power ($1 - \beta$ error probability), and an allocation ratio ($N2/N1$) of 1: the estimated total sample size is 834 (non-centrality parameter $\delta = 3.610$, critical $t = 1.963$, $df = 832$).

Participants were aged 12–15 years (mean = $13.44 \pm .94$ SD). The mean age for primary Welsh speakers was $13.47 (\pm 1.03$; males = 13.47 ± 1.08 ; females = $13.48 \pm .99$), and the mean for non-Welsh speakers was $13.42 (\pm .89$; males = $13.37 \pm .868$; females = $13.46 \pm .91$). The top panel of Table 1 shows the self-identified ethnicities of the pupils attending Welsh/bilingual-medium schools. Fisher's exact test revealed no difference in the proportion of Welsh and non-Welsh speaking pupils' self-identified ethnicities, $p = .459$.

Socio-economic analysis (SES) was derived from the WIMD (Welsh Index of Multiple Deprivation, 2014), which ranks geographical areas from 1 (most deprived) to 1909 (least deprived) and accommodates eight socio-economic categories (income, employment, health, education, access to services, community safety, physical environment, and housing). A breakdown into the seven classifications of these rankings is shown in the bottom panel of Table 1 for both groups. SES data was subjected to a Mann-Whitney U test to determine whether there were differences between Welsh and non-Welsh speakers. Visual inspection of the population pyramid suggested a similar shape between ranks 3 to 7, but they differed on ranks 1 and 2. WIMD ranking scores for Welsh speakers (mean rank = 277.21) were

Table 1 Ethnicity and socio-economic status

	White	Black	Asian	Mixed	Other	Do not wish to say	Missing data	Total including missing data	Total excluding missing data	
Welsh speakers	222 (93.7%)	1 (0.4%)	1 (0.4%)	4 (1.7%)	1 (0.4%)	8 (3.4%)	80 (25.2%)	317	237	
Non-Welsh speakers	377 (89.5%)	3 (0.7%)	2 (0.5%)	19 (4.5%)	2 (0.5%)	18 (4.3%)	98 (18.9%)	519	421	
Total	599 (80.1%)	4 (0.5%)	3 (0.4%)	23 (3.1%)	3 (0.4%)	26 (3.5%)	178 (21.3%)	836	748	
	Most deprived	Second deprived	Third Most deprived	Fourth Most deprived	Third Least deprived	Second Least deprived	Least deprived	Missing data	Total Including missing data	Total Excluding missing data
Welsh speakers	11 (6.1%)	8 (4.4%)	57 (31.5%)	64 (35.4%)	21 (11.6%)	6 (3.3%)	14 (7.7%)	136 (42.9%)	317	181
Non-Welsh speakers	55 (17.4%)	57 (18.0%)	63 (19.9%)	65 (20.5%)	30 (9.5%)	19 (6.0%)	28 (8.8%)	202 (38.9%)	519	317
Total	66 (13.3%)	65 (13.1%)	120 (24.1%)	129 (25.9%)	51 (10.2%)	25 (5.0%)	42 (8.4%)	338 (40.4%)	836	498

significantly higher than for non-Welsh speakers (mean rank = 233.68), $U = 33704$, $z = 3.310$, $p < .001$.

Schools

The inclusion criteria were that the school must be a Welsh/bilingual-medium state maintained school located within Wales. There were 55 Welsh/bilingual-medium secondary schools located throughout Wales (Welsh Schools Database, 2020), and schools were randomly selected using an online random number generator (RANDOM.ORG, 2020). Following discussions with head teachers and deputy head teachers, five Welsh/bilingual-medium secondary schools agreed to participate, and these were located throughout Wales (rolls 652, 632, 617, 396, and 81).

Materials

The Welsh/bilingual schools received bilingual questionnaires, which had been translated into Welsh by Swansea University's, University's Welsh Translation Team.

Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1979) is a 10-item self-report Likert-type inventory measuring global self-esteem (Kling et al., 1999). Each item consists of a simple statement (e.g. 'On the whole, I am satisfied with myself'), rated on a 4-point scale (0 = *Strongly Disagree* to 3 = *Strongly Agree*). Summation of all items provides a score range of 0 to 30, with higher scores denoting higher levels of self-esteem. The RSES has excellent psychometric properties and is considered valid and reliable (Martin-Albo et al., 2007; Vasconcelos-Raposo et al., 2012). The internal reliability of the scale for the present study (Cronbach's α) for all participants was .859 (.848 for primary Welsh speaking participants and .859 for non-Welsh speaking participants).

Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2017) is a six-item self-report Likert-type inventory. Each item consists of a simple statement (e.g. 'I spend a lot of time thinking about social media or planning how to use it'), rated on a 5-point scale (1 = *Very Rarely* to 5 = *Very Often*). Summation of items provides a score range of 6 to 30, with higher scores denoting higher levels of social media dependency. A cut-off score of over 19 suggests problematic usage of social media (Raudsepp, 2019; Wong et al., 2020). The BSMAS has reported excellent psychometric properties and is considered valid and reliable (Banyai et al., 2017; Lin et al., 2017; Monacis et al., 2017). The internal reliability of the scale for the present study (Cronbach's α) for all participants was .764 (.783 for primary Welsh speaking participants, and .756 for non-Welsh speaking participants).

Center for Epidemiologic Studies Depression Scale (CES-DC; Fendrich et al., 1990) is a 20-item self-report Likert-type inventory. Each item consists of a simple statement (e.g. 'I felt down and unhappy'), rated on a 4-point scale (0 = *Not at all* to 3 = *A lot*). Summation of all items provides a score range 0–60, with higher scores denoting higher levels of depression. The CES-DC is considered a valid and reliable measure of depressive symptoms (Ohannessian, 2012; Shapira et al., 2020). The internal reliability of the scale for the present study (Cronbach's α) for

all participants was .921 (.912 for primary Welsh speaking participants, and .922 for non-Welsh speaking participants).

Liebowitz Social Anxiety Scale for Children and Adolescents Self-Report (LSAS-CA-SR; Masia-Warner et al., 2003) comprises 48 items, 24 measuring fear, and 24 measuring avoidance. Each item is rated on a 4-point Likert-type scale (0 = *No fear* to 3 = *Severe* for fear; and 0 = *Never* to 3 = *Usually* for avoidance). Summation of the 48 items gives a range of 0 to 154 and provides an overall estimation of social anxiety, with higher scores denoting a higher level of social anxiety. The LSAS-CA-SR is considered a valid and reliable measure of social anxiety (Olivares et al., 2009; Schmits et al., 2014). The internal reliability of the scale for the present study (Cronbach's α) for all participants was .957 (.953 for primary Welsh speaking participants and .959 for non-Welsh speaking participants).

Children's Loneliness Scale (CLS; Asher & Wheeler, 1985) is a 24-item Likert-type inventory (eight items are dummy items and are excluded from CLS estimations). Each item consists of a simple statement (e.g. 'I'm lonely at school'), rated on a 5-point scale (1 = *That is not true about me at all* to 5 = *That is always true about me*). Summation of all items provides a score range 16–80, with higher scores denoting higher levels of loneliness. The CLS is considered a valid and reliable measure of loneliness (Asher et al., 1984; Luo et al., 2020). The internal reliability of the scale for the present study (Cronbach's α) for all participants was .905 (.895 for primary Welsh speaking participants and .908 for non-Welsh speaking participants).

Procedure

Parents/guardians and pupils received an information sheet and consent form explaining the purpose of the research, assurance regarding anonymity, identified risks and benefits, and contact points for further information, which they both signed and dated if they consented to take part in the survey. Consenting participants received questionnaire booklets in-class with the class teachers present, who were able to assist with completion-related enquiries. Points-of-contact were printed on the forms, and participants were free to raise questions and concerns. Questionnaire completion time was 45–50 min.

Results

Table 2, below, reveals the mean scores for the overall sample, and each group, for each of the variables. The table also provides *t*-test results between the groups (including Bayes) for each variable. These analyses demonstrated that primary Welsh speakers educated in the Welsh medium had higher self-esteem, and lower depression, loneliness, and social anxiety than primary English speakers educated in the Welsh medium, but there was no significant difference in social media dependency.

Pearson correlations, displayed within Table 3, below, were generated for both groups and inter-group comparisons conducted, and these results are displayed below

Table 2 Mean scores, *T*-tests, and Bayes

	Mean scores			<i>T</i> -test and Bayesian values				
	Sample	Welsh speakers	Non-Welsh speakers	<i>t</i> (834)	<i>P</i>	<i>d</i>	BF ₁₀	Error %
Self-esteem	18.22	19.49	17.45	-5.648	<.001	-.40	387,691.319	5.207e-10
Social media D.	3.649 ¹	3.632 ¹	3.659 ¹	.571	>.30	.04	.093	.002
Depression	3.985 ¹	3.643 ¹	4.194 ¹	5.332	<.001	.38	74,418.867	2.680e-9
Loneliness	5.673 ¹	5.473 ¹	5.795 ¹	4.692	<.001	.33	3469.114	5.583e-8
Social anxiety	6.711 ¹	6.332 ¹	6.942 ¹	3.981	<.001	.28	178.485	1.044e-6

¹SQRT transformed values

along with the Bayes statistics. Inspection of these data shows significant relationships between both social media dependency and self-esteem and each of depression, social anxiety, and loneliness. Table 4 shows the inter-group comparisons between the correlation coefficients (top panel) and slopes (bottom panel). The table reveals two findings: Pearson and Bayesian analyses suggest statistically significant associations between the tested variable pairings for both groups, and there were no statistically significant differences between Welsh and non-Welsh speakers' responses.

To obtain the most parsimonious model for the data, data was subjected to full structural equation model (SEM) analyses incorporating exploratory factor analysis (EFA), followed by confirmatory factor analysis (CFA). Data were analysed using SPSS Statistics version 26.0 and SPSS Amos Graphics version 25.0. Following Hu and Bentler (1999) and Costa et al. (2020), the following model fit criteria were

Table 3 Pearson correlations and Bayes scores for Welsh and non-Welsh speakers

		Self-esteem	Social media dependency	Depression	Loneliness	Social anxiety
Welsh speakers:						
Self-esteem	Pearson	-	-.408*	-.716*	-.457*	-.412*
	BF ₁₀	-	1.788e+11	4.722e+47	6.314e+14	2.915e+11
	<i>N</i>	317	317	317	317	317
Social media	Pearson	-.408*	-	.409*	.167**	.196*
	BF ₁₀	1.788e+11	-	1.978e+11	5.763	32.206
Non-Welsh speakers:						
Self-esteem	Pearson	-	-.300*	-.712*	-.529*	-.451*
	BF ₁₀	-	2.071e+9	8.600e+77	2.989e+35	1.293e+24
	<i>N</i>	519	519	519	519	519
Social media	Pearson	-.300*	-	.352*	.126**	.158*
	BF ₁₀	2.071e+9	-	3.152e+13	3.456	38.400

*Holm-Bonferroni corrected $\alpha = .0002 < .05$ (2-tailed)

**Holm-Bonferroni corrected $\alpha = .006 < .05$ (2-tailed)

Table 4 Welsh and non-Welsh speakers' coefficient comparisons (top panel: Pearson; bottom panel: slope coefficients)

	Welsh speakers <i>r</i>	Non-Welsh speakers <i>r</i>	<i>Z</i>	<i>p</i>
Self-esteem and social media	-.408	-.300	-1.728	0.084
Self-esteem and depression	-.716	-.712	-0.114	>.30
Self-esteem and loneliness	-.457	-.529	1.331	0.183
Self-esteem and social anxiety	-.412	-.451	0.700	>.30
Social media and depression	.409	.352	0.932	>.30
Social media and loneliness	.167	.126	0.585	>.30
Social media and social anxiety	.196	.158	0.548	>.30
	Welsh speakers Slope (SE)	Non-Welsh speakers Slope (SE)	<i>t</i> (832)	<i>p</i>
Self-esteem and social media	-0.389 (4.380)	-0.280 (4.545)	0.017	>.30
Self-esteem and depression	-1.564 (7.755)	-1.729 (8.977)	0.014	>.30
Self-esteem and loneliness	-0.980 (9.435)	-1.188 (9.876)	0.015	>.30
Self-esteem and social anxiety	-2.203 (23.263)	-2.513 (25.034)	0.009	>.30
Social media and depression	0.880 (10.324)	0.946 (11.873)	0.004	>.30
Social media and loneliness	0.354 (10.626)	0.320 (11.450)	0.002	>.30
Social media and social anxiety	1.068 (25.048)	1.009 (27.813)	0.002	>.30

applied to the data: χ^2/df (<3 good; <5 sometimes acceptable); comparative fit index (CFI) (>.95 excellent; >.90 standard; >.80 tolerated); goodness-of-fit (GFI) (>.95); adjusted goodness-of-fit (AGFI) (>.80); root mean square error of approximation (RMSEA) (<.05 excellent; .05-.10 standard; >.10 not acceptable); (standardized) root mean square residual (SRMR) (<.08); and *p* Close Fit (PCLOSE) (>.05). Prior to SEM analyses, data was screened using Mahalanobis distance, Cook's distance, and centred leverage value. Winsorization was applied to 7 and 10 Welsh and non-Welsh speaking subjects, respectively. Data demonstrated acceptable multicollinearity (significance levels were all <.001, and *r* values ranged from .157 to .418), normality, linearity, homogeneity, and homoscedasticity.

The first step in the process was EFA, where the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (KMO = .950) exceeded the desired .70 (Kaiser, 1974), and Bartlett's Test of Sphericity ($\chi^2(4950) = 49220.339$, $p < .001$) was significant, which indicates that the matrix is not an identity matrix; that is, the variables are sufficiently related to one another to permit execution of EFA. Analysis of the communalities table (extraction method: maximum likelihood) suggested that three items were < 3. Total variance loaded on 18 factors, as opposed to the desired 5 (cumulative value at 5 = 40.1%; cumulative value at 18 = 53.6%), and acceptable goodness-of-fit indices were returned ($\chi^2(3303) = 6681.558$, $p < .001$).

The initial pattern matrix demonstrated significant levels of cross-loading (21 of the 100 items cross-loaded), which required resolution. Following 60 iterations, a clean pattern matrix, with no cross-loadings was attained. KMO (.941) exceeded the desired .70, and Bartlett's test of sphericity ($\chi^2(2346) = 29401.296$, $p < .001$) was significant. The communalities table suggested that six items were

< 3. Total variance was loaded on 12 factors (cumulative value at 5 = 39.9%; cumulative value at 12 = 50.1%). Acceptable goodness-of-fit indices were returned ($\chi^2(1584) = 3419.253, p < .001$). The resolved pattern matrix, depicted in Table 5, demonstrated acceptable convergent validity (all items were > 3).

The factor correlation matrix indicated that no factor loadings were > .7, which is acceptable. Pattern matrix resolution necessitated item redundancy for 3 of the 5 deployed scales (depression reduced from 20 to 12 items; loneliness reduced from 16 to 12 items; and social anxiety reduced from 48 to 29 items). Subsequent analyses (including Cronbach's α calculations) united the items, such that all self-esteem items were unified, all social media dependency items were unified, all depression items were unified, all loneliness items were unified, and all social anxiety items were unified. Thus, the tested model comprised five factors, whose Cronbach's α values were all acceptable and are shown in Table 6.

The second step in the process was CFA, using the EFA-moderated scales. The following 'analysis properties' were selected: minimization history; standardized estimates; modification indices; indirect, direct, and total effects; threshold for modification indices = 20; number of bootstrap samples = 1000; BC confidence level = 95; and boot factor = 1. Execution of the initial CFA realized poor model fit criteria. However, following application of recommended covariances, the model fit indices improved. Both pre- and post-covariance model fit indices are depicted in Table 7.

Table 8 demonstrates the strength of the linear relationship between the variables, where the displayed 'equation' references the strongest F statistic.

Acceptable levels of multicollinearity were demonstrated, in that the tested variance inflation factor (VIF) scores were all < 3, which is acceptable (O'Brien, 2007; Rahman & Mia, 2020): dependent variable depression VIF = 1.411; dependent variable loneliness VIF = 1.306; and dependent variable social anxiety VIF = 1.559. Given this, the covaried structural model shown in Fig. 2, below, was tested. Model fit indices were re-tested for the above model, which demonstrated an acceptable model fit ($\chi^2/df = 2.438$, GFI = .842, AGFI = .815, CFI = .894, RMSEA = .041, PCLOSE = 1.000, SRMR = .058).

The next stage in the process compared primary and non-primary Welsh speakers on the following paths to determine differences/similarities: social media dependency → depression; social media dependency → social anxiety; social media dependency → loneliness; social media dependency → self-esteem; depression → self-esteem; social anxiety → self-esteem; and loneliness → self-esteem. Inter-group comparison at the overall model level, using structural weights, indicated a difference on one or more of the tested paths ($df = 71$, CMIN = 157.078, $p < .001$). Accordingly, significance warranted comparative inter-group analysis on a path-by-path level. Employing structural weights, Table 9, below, indicates the following: (1) whether the paths were statistically significant for each group, i.e. the 'intra-group path significance' column, and (2) whether statistically significant differences prevailed between the groups for each path, i.e. the 'inter-group path comparison' column. (Note: Amos' 'multi-group comparison' function determined inter-group significance.)

Inter-group statistical significance prevailed with respect to all paths, with the exception of loneliness → self-esteem. With the exception of the associations

Table 5 Clean pattern matrix

	Factor											
	1	2	3	4	5	6	7	8	9	10	11	12
FEAR_7	.794											
FEAR_11	.746											
FEAR_21	.728											
FEAR_13	.718											
FEAR_5	.699											
FEAR_22	.684											
FEAR_12	.650											
FEAR_23	.630											
FEAR_4	.577											
FEAR_18	.545											
FEAR_10	.528											
FEAR_6	.528											
FEAR_16	.524											
FEAR_3	.523											
FEAR_2	.480											
FEAR_1	.381											
AVOID_1		.887										
AVOID_2		.868										
AVOID_3		.688										
AVOID_6		.582										
AVOID_10		.516										
AVOID_16		.503										
AVOID_12		.500										
AVOID_17		.344										
DEP_7			.840									
DEP_11			.676									
DEP_5			.641									
DEP_20			.549									
DEP_9			.512									
DEP_2			.469									
LONE_24				.709								
LONE_3				.654								
LONE_18				.627								
LONE_14				.593								
LONE_20				.548								
LONE_21				.545								
LONE_1RC					.753							
LONE_4RC					.611							
LONE_16RC					.605							
LONE_8RC					.588							
LONE_22RC					.582							
LONE_10RC					.458							

Table 5 (continued)

	Factor												
	1	2	3	4	5	6	7	8	9	10	11	12	
BSMAS_2						.686							
BSMAS_1						.652							
BSMAS_5						.650							
BSMAS_6						.581							
BSMAS_3						.551							
BSMAS_4						.525							
RSES_6RC							-.711						
RSES_9RC							-.605						
RSES_2RC							-.507						
RSES_8RC							-.449						
RSES_5RC							-.427						
RSES_3								-.814					
RSES_7								-.639					
RSES_4								-.549					
RSES_1								-.546					
RSES_10								-.491					
DEP_18									.908				
DEP_17									.817				
DEP_6									.474				
AVOID_14										.808			
AVOID_13										.740			
AVOID_15										.549			
AVOID_8											.742		
AVOID_9											.738		
DEP_15												.710	
DEP_19												.519	
DEP_14												.496	

Extraction method: maximum likelihood. Rotation method: Promax with Kaiser normalization

^aRotation converged in 9 iterations

between depression → self-esteem, and social anxiety → self-esteem, for primary Welsh speakers, statistically significant associations were obtained for both groups

Table 6. Cronbach's α values post-pattern matrix resolution

Scale	Cronbach's α	Number of items retained
Self-esteem (RSES)	.852	10
Social media dependency (BSMAS)	.786	6
Depression (CES-DC)	.908	12
Loneliness (CLS)	.854	12
Social anxiety (LSAS-CA-SR)	.930	29

Table 7 Pre- and post-covariance model fit indices

Indexes	Pre-covariance Model fit indices	Post-covariance Model fit indices
χ^2/df	4.760	2.170
CFI	.695	.914
GFI	.649	.862
AGFI	.626	.838
RMSEA	.067	.037
PCLOSE	.000	1.000
SRMR	.069	.051

for each variable pairing (appendices A and B depict the structural weights for Welsh and non-Welsh speakers, respectively, in model format).

Thus, Welsh speakers retained the stronger association for: (H1) social media dependency \rightarrow self-esteem ($-.654, p = .007$ versus $-.133, p = .031$); (H3) social media dependency \rightarrow depression ($.845, p < .001$ versus $.501, p < .001$); (H5) social media dependency \rightarrow loneliness ($.751, p < .001$ versus $.405, p < .001$); and (H7) social media dependency \rightarrow social anxiety ($.747, p < .001$ versus $.429, p < .001$). However, non-Welsh speakers demonstrated the stronger association for the paths (H2) depression \rightarrow self-esteem ($-.590, p < .001$ versus $-.247, p = .095$) and (H6) social anxiety \rightarrow self-esteem ($-.216, p < .001$ versus $.104, p = .277$). There was no statistically significant difference for (H4) loneliness \rightarrow self-esteem.

Table 8 Confirmatory factor analysis linear relationships

Equation	R^2	$F(1, 834)$	p
Relationship: social media dependency \rightarrow depression ¹			
Logarithmic	.121	114.501	<.001
Relationship: social media dependency \rightarrow loneliness ²			
Compound	.038	32.863	<.001
Relationship: social media dependency \rightarrow social anxiety			
Linear	.047	41.036	<.001
Relationship: social media dependency \rightarrow self-esteem ³			
Logarithmic	.127	121.290	<.001
Relationship: depression \rightarrow self-esteem			
Linear	.442	660.915	<.001
Relationship: loneliness \rightarrow self-esteem			
Linear	.289	339.794	<.001
Relationship: social anxiety \rightarrow self-esteem			
Linear	.250	278.208	<.001

¹Linear: $r^2 = .116$; $F = 109.484$; $df1 = 1$; $df2 = 834$; Sig. <.001

²Linear: $r^2 = .035$; $F = 30.135$; $df1 = 1$; $df2 = 834$; Sig. = .001

³Linear: $r^2 = .122$; $F = 116.415$; $df1 = 1$; $df2 = 834$; Sig. <.001

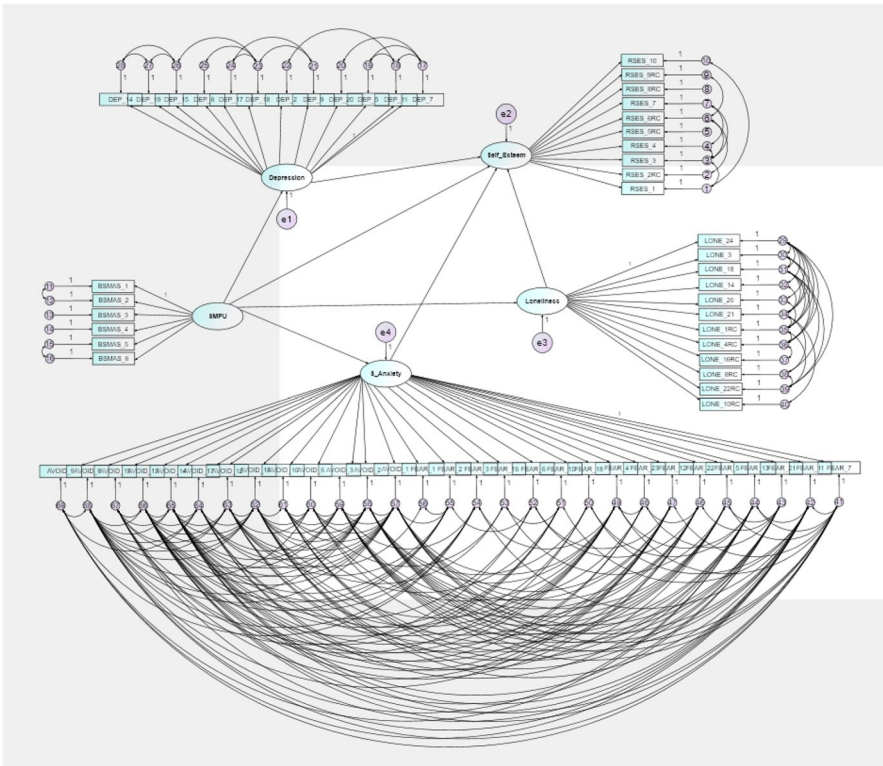


Fig. 2. Confirmatory factor analysis covaried model

Discussion

The current results suggest that Welsh speakers demonstrated stronger associations between social media dependency and self-esteem, depression, social anxiety, and loneliness. In each case, these data provide support for the social media dependency-specific hypotheses (i.e. H1, H3, H5, and H7). Reflecting upon ethnolinguistic analyses covered at the outset, it might be conjectured that a realization that not all Welsh speakers use Welsh on social media (Cunliffe et al., 2013; McAllister et al., 2013) might transmit a negative message regarding the value and vitality of the Welsh language with respect to the wider society beyond the Welsh speaking collective. This conceivably negatively impacts Welsh speakers' levels of self-esteem (Baker, 1996; Brandt, 1988). Concomitantly, present findings suggest that low self-esteem Welsh speakers might be at greater risk of experiencing social media dependency's positive association with each of the stated variables.

Other aspects of the present data corroborate previously established findings. Previous empirical research has suggested positive associations between social media dependency and each of depression, loneliness, and social anxiety, and these relationships are borne out by the current data. Additionally, previous data suggests negative associations between self-esteem and each of depression, loneliness, and social

Table 9 Intra- and inter-group path-by-path comparisons

Intra-group path significance			Inter-group path comparison		
Group	Structural weight estimate	Structural weight <i>p</i> -value	<i>df</i>	CMIN	<i>p</i>
Path: social media dependency → depression					
Welsh speakers	.845	<.001	1	12.978	<.001
Non-Welsh speakers	.501	<.001			
Path: social media dependency → loneliness					
Welsh speakers	.751	<.001	1	11.836	.001
Non-Welsh speakers	.405	<.001			
Path: social media dependency → social anxiety					
Welsh speakers	.747	<.001	1	12.729	<.001
Non-Welsh speakers	.429	<.001			
Path: depression → self-esteem					
Welsh speakers	-.247	.095	1	5.705	.017
Non-Welsh speakers	-.590	<.001			
Path: social anxiety → self-esteem					
Welsh speakers	.104	.277	1	9.494	.002
Non-Welsh speakers	-.216	<.001			
Path: loneliness → self-esteem					
Welsh speakers	-.093	.022	1	1.822	.177
Non-Welsh speakers	-.094	.022			
Path: social media dependency → self-esteem					
Welsh speakers	-.654	.007	1	9.804	.002
Non-Welsh speakers	-.133	.031			

anxiety, and these associations were supported by the data (excluding the paths social anxiety → self-esteem and depression → self-esteem for Welsh speakers, which, contrary to expectation, demonstrated non-statistically significant results).

Recognizing a negative association between social media dependency and self-esteem (Kuss & Griffiths, 2011) — an association supported by the present data — conceivably, Welsh speakers' expectations that their Welsh language ambitions might be satisfied through online interactions might be met by disappointment in that not all Welsh speakers use Welsh on social media (e.g. Cunliffe et al., 2013). Concomitantly, an appreciation and even acceptance that not all Welsh speakers use Welsh online might encourage a perception within Welsh speakers' minds that perhaps their heritage language, families, and communities retain little importance to the wider world — a perception that conceivably diminishes Welsh speakers' self-esteem levels (Baker, 1996; Brandt, 1988). Applying Kuss and Griffiths' (2011) analysis to the linguistic setting, harbouring distorted expectations regarding social media's ability to satiate their linguistic needs, the low self-esteem individual might experience a desire to devote more time to social media, thereby establishing a catch-22 situation; an assertion that has received implicit support from Hawi and Samaha (2016) who suggested that low self-esteem individuals develop a dependency upon social media.

Propounding a possible causal explanation for the negative association between social media dependency and self-esteem, application of Andreassen et al. (2017) to the present data suggests that low self-esteem Welsh speakers' increased social media usage may be driven by a desire to escape feelings of low self-esteem and/or to obtain higher levels of self-esteem via the harvesting of 'likes'. Suggesting social media usage might be a consequence and/or a predictor of self-esteem; the latter authors indicated that low self-esteem individuals might prefer to communicate online, as opposed to face-to-face, and this might hold relevance regarding primary Welsh speakers experiencing diminished levels of self-esteem.

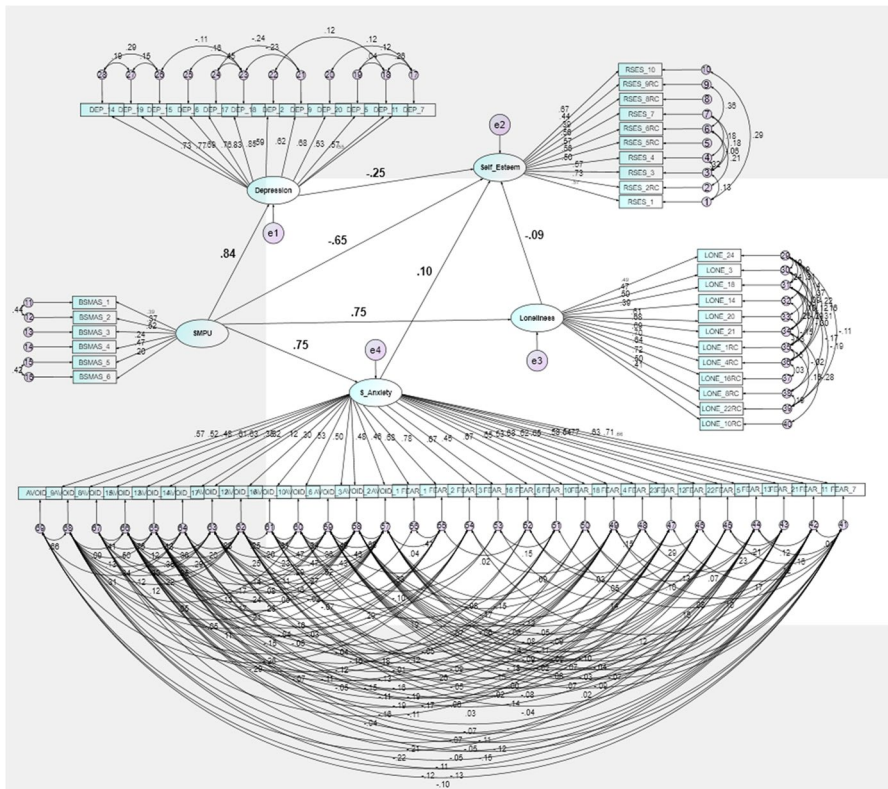
Expanding and referentially accommodating social anxiety, Marino et al.'s (2018) review indicated that individuals simultaneously experiencing low self-esteem and high social anxiety might consider face-to-face communication problematical and, accordingly, migrate toward online forms of communication as these better accommodate their perceived inadequate social skills. Furthermore, individuals fearing rejection during face-to-face social interactions might gravitate toward social media as a means of dealing with rejection issues (Kose & Dogan, 2019), which is an indicator of impaired self-esteem. Relatedly, low self-esteem individuals might simply perceive the social media environment as a safer place to express themselves (Ardiana & Tumanggor, 2020; Liu & Ma, 2018). Accommodating Baker's (1996) assertion that societal devaluation of an individual's language negatively impacts individuals' self-esteem levels, low self-esteem Welsh speakers might be attracted to social media as a means of attaining social approval (Acar et al., 2020).

Kircaburun et al. (2019) suggested that low self-esteem individuals might increasingly engage with social media as a way of compensating their need for real-world social interaction or simply as an avoidance tactic to reduce the frequency of offline social interactions. Recognizing how Welsh speakers' self-esteem levels might be negatively impacted via perceived societal devaluation of their heritage language within the social media domain (e.g. Baker, 1996), a paradoxical sequence of events might occur: perceiving a devaluation of their heritage language within the online environment, Welsh speakers' reduced self-esteem levels negatively impact their offline social interactions, such that they engage in online social interaction as a means of satiating their need for social interaction per se or simply as a way of avoiding their perceived negative offline social interactional experiences and perceptions. Such a social compensation aspect has received support from Hou et al. (2019).

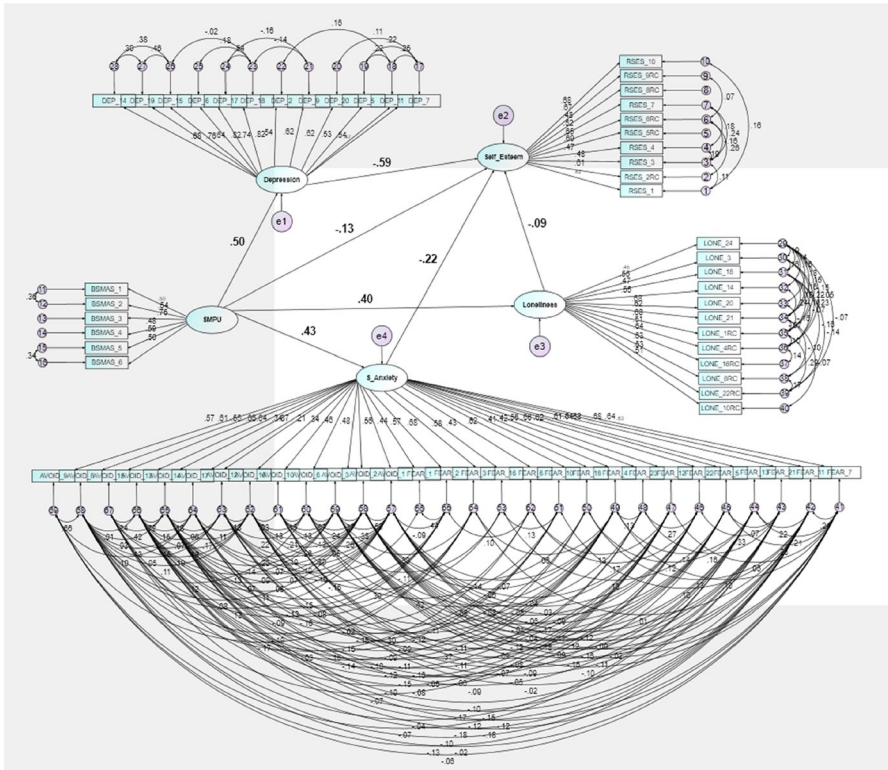
Caution is required in these interpretations, as the analysis is cross-sectional in nature, and causality has not been demonstrated. Furthermore, the deployed scales were self-report in nature, and social desirability bias cannot be ruled out. Future studies might be encouraged to replicate the present findings using longitudinal designs and, also, employing a combination of explicit and implicit measures of self-esteem. This is the first study of its kind and would benefit from being replicated and refined through additional research. Nevertheless, the key finding from the current exploration is that whenever social media dependency assumed the predictor variable role, the hypothesized associations between social media dependency and each of depression, loneliness, social anxiety, and self-esteem were upheld with respect to Welsh speakers, relative to non-Welsh speakers.

Appendix

Appendix 1. Structural weight model: Welsh speakers



Appendix 2. Structural weight model: non-Welsh speakers



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Code Availability No code was generated.

Author Contribution Richard Jones: concept, design, data acquisition and analysis, literature review, and discussion

Irene Reppa: critically revised the manuscript and submission approval

Phil Reed: critically revised the manuscript and submission approval

Data Availability The data that supports the findings of this study are available from the corresponding author upon request.

Declarations

Ethics Approval Ethical consent to proceed with the research was received from Swansea University’s Department of Psychology, Ethics Committee.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Consent for Publication The authors grant consent for publication.

Conflict of Interest The authors declare no competing interests.

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