

Measuring fake news acumen using a news media literacy instrument

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ABSTRACT

News media literacy education is gaining increased attention in the age of fake news and post-truth America. However, as with any pedagogical goal, it is important to be able to evaluate the success of the delivery. In a survey built on existing news literacy frameworks, 1476 students at a large Canadian polytechnic answered questions about their own news literacy, fake news acumen, and news consumption habits. Analysis of the data suggests that conscientious fake-news attitudes and behaviors are correlated with an existing news media literacy scale, providing a method of evaluating the success of fake news education efforts.

Keywords: *news media literacy, media literacy, misinformation, disinformation, fake news.*



INTRODUCTION

Increased suspicion of traditional news media structures, coupled with an increasingly balkanized and polarized electorate and a proliferation of social media platforms enabling rapid sharing of information (truthful or not) have created a situation where news media literacy is perhaps more important than ever.

As seen in the misinformation and disinformation on topics such as voter fraud and vaccine skepticism, there is no shortage of incorrect information available to media consumers. The effect of filter bubbles, algorithms, and general preference for information sharing over social media has created miniature ecosystems exhibiting unprecedented degrees of homophily. Social media platforms also have an accelerating effect on how quickly a piece of incorrect information can proliferate, in many cases outpacing efforts to correct it.

Various efforts have been made to ameliorate the situation, including news media literacy training, fact checking, and removal or censorship by social media platforms of incorrect or misleading information. In some cases, these have been sponsored by impartial organizations such as universities, or by interested parties such as major social media platforms. Often, these initiatives are offered out of convenience: either in proximity to the suspect information (as in the case of labeling by social media platforms on individual content items), or proximity to an audience already interested in the topic (as in workshops offered as an optional course at a university, or in an online Coursera course). There is little apparent targeting to vulnerable populations, possibly because there is little understanding of just who is most vulnerable to fake news.

This paper doesn't answer the question of who is vulnerable to fake news, but it does offer a step forward in connecting an established instrument used to measure news media literacy to a core set of beliefs, attitudes and practices that have been shown to combat individual vulnerability to fake news. It provides a tool that can be used to identify the susceptibility of an individual to fake news.

LITERATURE REVIEW

As society has moved from a monologic model prevalent in print news and broadcasting to a hybrid

model of broadcast and dialogic sharing prevalent on social media, the result has been a balkanization of traditional media sources and broadcast mechanisms. In times past, traditional broadcast models created a public discourse of common news artifacts as citizens discussed the morning paper during their coffee breaks. News discovery now extends to myriad sources from faceless friends (Wong & Burkell, 2017). Now that information comes from a less diverse group of traditional sources (as traditional media encounters financial challenges) and an ever-increasing group of non-traditional sources (potentially funded by interest groups and nefarious actors), the resultant high-choice media environment has profoundly changed the news environment (Van Aelst et al., 2017). The central "watering hole" of media information has decreased in importance as a place of common discourse.

Fake news, misinformation and disinformation

The term fake news has become a buzz phrase in the era of Trump politics, as it has been co-opted by some actors as meaning news coverage they disagree with. In actual fact, fake news is deliberate disinformation, where there is an intent to deceive. Simply incorrect news coverage, with no deceptive intent is termed misinformation (Scheufele & Krause, 2019). Therefore, an incorrect or misleading article may be either disinformation or misinformation (Wardle & Derakhshan, 2018).

In defining disinformation and misinformation, the intent of the communicator is important (Quandt et al., 2019), and intent is a difficult thing to measure, particularly in an anecdotal instance. Some delineation between disinformation and misinformation may be elucidated by the overall reputation of a publication as well as signifiers within the article itself. Indeed, scholars have gone so far as to identify fake news by generating reputational metrics based on technological characteristics of a website alone – useful even in absence of analysis of the actual content on the site (Xu et al., 2020).

The susceptibility of an individual to belief (and onward dissemination) of misinformation and disinformation is a complex environment comprising several levels, including individual, group, and societal (Scheufele & Krause, 2019). In terms of individual espousal of misinformation and disinformation, responsibility can be largely

attributed to intrinsic factors. An individual may have predisposing beliefs, knowledge, or attitudes that increase or decrease susceptibility to false information. Indeed, cognitive bias plays a key role: an experiment conducted by EEG detected much less cognitive activity when viewers examined headlines that didn't align with their political opinions (Moravec et al., 2019). Even the consumption of food or drink during the viewing of news can significantly increase the persuasive effects of disinformation (Kano, 2018). Kahan describes a politically motivated reasoning process whereby political beliefs intercede before new data is used to challenge one's beliefs (Kahan, 2016). In broad terms, individuals are more likely to accept information that confirms rather than challenges their identity (Kahan, 2017). Further, both organized and informal efforts by individuals and organizations to debunk information adds a further degree of complexity to the environment surrounding individual susceptibility. Once incorrect views are espoused, they are easily spread on social media.

While formalized fact-checking or debunking efforts are made by a variety of third-party organizations (such as Snopes and FactCheck.org) and directly by social media platforms themselves, these efforts are challenged by several factors. First, consumers who espouse incorrect information may not believe the work of fact-checkers, sometimes viewing them as inept or biased (Brandtzaeg & Følstad, 2017). Second, fact checking does not result in equal corrections across political stripes, enhancing perceptions of bias (Walter et al., 2020). Third, individuals may be more likely to trust personally known sources – leading to a belief of information reposted by trusted friends over information posted by fact-checking organizations. This sharing of selected messages – “partisan selective sharing” – is at the root of many of the information flows on social media (Shin & Thorson, 2017). As information is in turn reposted to another circle of friends, a misinformation cascade is created, further spreading fallacious information (Sharma et al., 2021). In this way, homogeneity of belief in a connected social network creates an ideal situation for the spread of incorrect information. In some cases, even fact check data is selectively shared to followers, resulting in “ideologically narrow” streams of fact checks that may enhance claims of bias against fact-checking organizations (Shin & Thorson, 2017).

Simple labeling of dubious or fallacious information by social networks may not always be effective. Although labeling a single false item may decrease a fallacious article's perceived accuracy, the presence of general labeling reduces trust in accurate articles (Clayton et al., 2020). A growing distrust of social network providers (as opposed to members) means that the “official” voice of a social media platform may be at dissonance with the views of the believers – ultimately resulting in users exiting a social network (Pelletier et al., 2021). As social media networks become more aggressive in labeling and removing incorrect information, as well as punishing or banning people publishing such information, there is the potential for mass migrations of users from those platforms (as in the 2020 rise of the Parler social network among those espousing far right-wing political views and conspiracies not permitted on Facebook or Twitter). These migrations (temporary or permanent) to “morally homogenous” networks, further fractionalize the reading public, potentially fueling radicalism (Atari et al., 2021).

Even when groups of like-minded individuals remain on a social network, social media algorithms can play a role in the balkanization of news information. It is generally understood that algorithms prioritize the display of information that agrees with a personal point of view and deprioritize information challenging to personal views (Bechmann & Nielbo, 2018; Spohr, 2017). Scholarly work has alternately confirmed and refuted the effect of filter bubbles on reinforcing or challenging false information, but exposure to information diversity in general increases one's openness to differing points of view (Pariser, 2011; Zollo & Quattrociocchi, 2018; Zuiderveen Borgesius et al., 2016).

A set of behaviours and attitudes has been identified by scholars and educators as helpful in the fight against online misinformation and disinformation. Clicking through to read a story before sharing it based simply on the headlines is a simple but effective technique. This behaviour limits the spread of misinformation by challenging individuals to contemplate information before promoting it, but requires a higher degree of cognitive processing (Wang & Fussell, 2020). Attitudes and beliefs are important as well. For example, a simple practice is to not judge the veracity of a piece of information based on social endorsement – the number of “likes” or retweets that

it receives (Luo et al., 2020). This in particular is difficult to develop for two reasons: social media algorithms prioritize content that is widely “liked”, which decreases the exposure to less liked (but potentially more truthful) information; and also because the “conferred credibility” in a Facebook “like” may require an individual to now disagree with a trusted individual who has previously endorsed a piece of information (Cinelli et al., 2020; Metzger et al., 2010).

News media literacy

A more proactive way of addressing the problem of online misinformation and disinformation is through the development an internal locus of control in individuals of their news consumption habits: increasing news media literacy. There is considerable disagreement as to what, specifically, constitutes news media literacy (Vraga et al., 2021). Maksl et al. (2015) propose that “news media literacy is oriented toward understanding how and why people engage with news media, how they make sense of what they consume, and how individuals are affected by their own news consumption” (p. 29). However, increased news literacy needs to be differentiated from simple news appreciation (Hobbs, 2010). By equipping individuals with knowledge about media structures, critical thinking and discernment, these individuals might be “inoculated” against fallacious information (Miller, 2019). In general, the taxonomy and vocabulary surrounding news media literacy is still in flux – particularly in separation of the affective, cognitive and behavioural realms. Vraga et al. develop some distinction between these, proposing the term *news literacy* for the knowledge of how news is produced and consumed and skills useful in exerting control over these processes. Also proposed is the term *news literacy behaviours* for the concrete behaviours that occur when news is consumed in a critical manner (Vraga et al., 2021). However, this paper adopts the more general definition of news media literacy proposed by Maksl et al. (2015).

Improving news media literacy

Several initiatives have attempted to increase news media literacy (versus general media literacy), including workshops and classroom programming (both at a K-12 and collegiate level). Two broad conceptualizations of news media literacy education

exist: those that begin with theoretical underpinnings, and those that focus almost exclusively on the praxis of news consumption.

The theoretical model seeks to underpin action by first developing critical thinking skills through building an understanding of news media structures and the nature of the journalism they produce. The Stony Brook Center for News Media literacy is among the most influential programs espousing this approach (*What Is News Literacy?*, 2016). Notable and well-studied, the Stony Brook University model for news media literacy is “one of the most ambitious and well-funded curricular experiments in modern journalism education and media literacy” (Fleming, 2014). The Stony Brook model has its origins in an undergraduate course, and has since been offered at a number of other post-secondary institutions, as an open-access MOOC course, and as K-12 programming (Center for News Literacy, n.d.; Fleming, 2015; Kajimoto et al., n.d.). It has proven effective in increasing the news consumption acumen and understanding of news media among students (Maksl et al., 2017).

Contrary to the wider scope of the theoretical approach, the behavioural model specifically seeks to develop behaviours of news consumption and sharing. Programming is often delivered in a short workshop format, eschewing much discussion about media structures or the role of news within society, and focusing on the praxis of news consumption from a consumer perspective (Bonnet & Rosenbaum, 2020; Wade & Hornick, 2018). While significant research proves the effectiveness of the first model (and the Stony Brook curriculum in particular), there seems to be a dearth of research on the effectiveness of shorter praxis-based workshops.

Regardless of the model, there is little literature indicating how these news media literacy education initiatives measure susceptibility to fake news specifically. Although not a formal workshop program, Vraga, Tully and Bode come close to this kind of evaluation with examinations of the role of media literacy public service announcements and social media posts in influencing audience perception of credibility (2020; 2015).

Measuring news media literacy

Measuring the degree of news media literacy in an individual or group has increasingly been the object of academic work. This research has taken on a new urgency in the current situation of increasing

disinformation and misinformation (Vraga et al., 2021).

The measurement of news media literacy has diverged into two models, with academics espousing one or the other system, or combining both. In some cases, the measurement systems share a common name – the News Media Literacy Scale (NML Scale) even though they use significantly different measurement techniques, and the numerical scales are unrelated. There is no formal nomenclature to distinguish these two models, and little scholarly work has been done to differentiate the two and classify the resultant research employing them. This portion of the literature review attempts to distinguish these models and review their underpinnings.

One model has roots in Potter's *Theory of Media Literacy*, where a cognitive theory of general media literacy (applying to broader domains than news media literacy specifically) is postulated. He proposes four components to this cognitive theory: *Knowledge Structures*, *Personal Locus*, *Information Processing*, and *Competencies and Skills* (Potter, 2004). Together, these factors describe the media literacy of an individual or group. In 2015, Maksl, Ashley and Craft used this model to measure news media literacy (Maksl et al., 2015). They adopted the first three factors, *Knowledge Structures*, *Personal Locus*, and *Information Processing* – omitting *Competencies and Skills* (arguing that news media literacy is a consumptive, not creative process) (Maksl et al., 2015).

The 2015 Maksl, Ashley and Craft paper proposed a survey instrument with questions in three dimensions to address each of Potter's factors. Five questions in *Need for Cognition (NFC)* measured *Information Processing*, drawing on work from Epstein et. al (1996). Six questions in *Media Locus of Control (MLOC)* measured Potter's *Locus of Control*, drawing on work from Wallston et al. (1978). Lastly, fifteen questions in *News Media Knowledge Structures (KMS)* measured Potter's *Knowledge Structures*, drawing on a news media quiz from the Poynter Institute. The results were combined and an overall score was generated, dubbed a News Media Literacy (NML) scale. For the purposes of this study, this tool will be designated the MAC2015 instrument.

The MAC2015 instrument has been used by other researchers to measure aspects of news media literacy. For example, McWhorter used portions of the MAC2015 instrument to examine the effects of

news consumption on news media literacy and later to explore news media literacy with agenda-melding. However, this study adapted the MAC2015 instrument, not only adding questions but also modifying the Likert scale measuring the core questions (McWhorter, 2019, 2020).

Another news media literacy scale, mostly unrelated to the first except for being developed by the same scholars, was developed in 2013 (Ashley et al., 2013). The scale has roots in a media literacy study where participant reaction to anti-smoking initiatives was measured (Primack et al., 2006). Ashley, Maksl and Craft developed the measurement scale to apply more generally to media literacy, incorporating questions in three dimensions: *Audiences and Authors (AA)*, *Messages and Meaning (MM)*, and *Representation and Reality (RR)*. Together, scores in these dimensions were combined to obtain an overall score – also called a News Media Literacy score, although it is unrelated to, and not comparable with, the Potter-based NML score described previously. For the purposes of this paper, this will be designated the AMC2013 instrument. Notably, the AMC2013 instrument has been questioned by a recent study as ineffective in predicting whether readers will be able to identify fake news, but this test used an incomplete version of the AMC2013 instrument (Jones-Jang et al., 2021).

Although subsequent work by Ashley, Maksl and Craft appears to have largely transitioned to the MAC2015 score, other researchers have espoused the earlier AMC2013 model. It has been further developed by a number of scholars, notably Vraga, Tully and their collaborators, who used the AMC2013 model in a validation of some additional dimensions of *Self-Perceived Media Literacy (SPML)* and *Value of Media Literacy (VML)* (Vraga et al., 2015). Their work on the scale continues to evolve, and they have dropped the original dimensions of *AA*, *MM*, and *RR* in some recent work (Tully et al., 2020). Other scholars, too, have used this scale in their own work, sometimes adding dimensions of their own (Kendrick & Fullerton, 2019; Kleemans & Eggink, 2016). The value in the AMC2013 scale appears to lie in the conceptualization of a specific problem being investigated by the researcher, as opposed to work toward a general scale that can be used, unchanged, by other researchers.

Finally, there has been some intermingling of the MAC2015 and the AMC2013 models. For example,

Tully and Vraga blend the two models in a paper connecting news media literacy to democratic attitudes and behaviours, adopting their standard AMC2013 suite of *AA*, *MM*, *RR*, *SPML*, *VML* and others with MAC2015 dimensions of *NFC* and *MLOC* (Tully & Vraga, 2017). In general, there is an increasing dissatisfaction with the various measures of news media literacy, with critics (including some creators of the original models themselves) citing inadequate theoretical underpinnings and a conflation of news literacy itself with the behaviours that stem from news literacy (Vraga et al., 2021).

RESEARCH QUESTION

Given the importance of misinformation and disinformation in today's media landscape, and the availability of a suite of news media literacy measurement instruments, determining one that can be effectively used to measure acumen and susceptibility to fake news is desirable. Since the MAC2015 instrument focuses more on praxis than the AMC2013 instrument, this paper proposes the following research question: *RQ1: Is the existing MAC2015 media literacy instrument useful in predicting fake news acumen?*

News media literacy training seeks to improve the practice of news consumption, including objectives to “identify, evaluate, analyze and appreciate journalism in the digital age” (Fleming, 2014). Such news media literacy training has been shown to be positively associated with higher news media literacy scores (Maksl et al., 2017). Identifying and evaluating sources is intrinsic to informed news consumption, and a critical component in identifying fake news (Bonnet & Rosenbaum, 2020), and such skills are taught in news media literacy training programs shown to improve news media literacy scores. Based on these propositions, the following hypotheses are presented:

- *H1: News Media Literacy scores are correlated with an increased confidence in identifying fake news*
- *H2: News Media Literacy scores are correlated with positive anti-fake news behaviour*
- *H3: News Media Literacy scores are correlated with positive anti-fake news attitudes*

- *H4: News Media Literacy scores are negatively correlated with admissions of sharing false news*
- *H5: News Media Literacy scores are positively correlated with perception that fake news is a problem.*

METHOD

The Potter-based MAC2015 Ashley, Maksl and Craft News Media Literacy scale was selected for this study because of the potential of this more-standardized NML scale for more consistent deployment than the 2013 Primack-based AMC2013 instrument that has been considerably adapted from study to study.

The 26-question multiple-choice core MAC2015 NML instrument comprises questions in three domains: Need for Cognition (NFC, 5 questions); Media Locus of Control (MLOC, 6 questions); Knowledge of Media Structures (KMS, 15 questions). Questions in the first two domains were used unaltered. Knowledge of Media Structures questions were designed for American respondents, and several questions in this domain were adapted to reflect the Canadian media landscape, preserving as much as possible the nature of each question.¹

Appended to the existing NML instrument were 15 questions that measured specific attitudes, beliefs and behaviours to fake news, as well as trust and use of various news platforms. Five demographic questions were also included. The resulting survey instrument consisted of 46 multiple-choice questions. This survey was tested on ten individuals within the target group and was refined for formatting and question clarity through an iterative process (although core MAC2015 questions were used unaltered or modified as described above). Ethics approval was sought and obtained from the institutional Research Ethics Board.

The questions were encoded in an online survey instrument (SurveyMonkey) and distributed by email to the entire student population at the Southern Alberta Institute of Technology (SAIT) in Calgary, Canada. 21,306 survey invitations were sent. The initial invitation was followed with a reminder email approximately a week later. In total, 1476 complete survey responses were gathered, a response rate of 6.93%.

¹ Upon request, the author will gladly provide the MAC2015 KMS questions modified for the Canadian media landscape.

The survey respondents had an average age of 26.7, an unsurprising result given SAIT’s provision of career-focused programming to a diverse student group ranging from recent high school graduates to those interested in “reskilling” later in their careers. Most respondents spoke English as their primary language at home (79.4%). The vast majority of respondents had no previous experience in journalism such as a high school or college newspaper (88.1%).

In the survey questions, the term “fake news” was used as a proxy for the phrase “misinformation and disinformation”. Although the latter is simultaneously more descriptive and more inclusive, it has not yet entered popular use to the extent that “fake news” has for lay audiences. Fake news has a universally negative connotation for people regardless of political conviction: something fake is never good. Furthermore, the term needed no further elucidation in the survey – respondents could think about “fake news” as something they would neither want to encounter nor promulgate.

There is the potential for a non-response bias in the participant pool. Those more interested and concerned with media literacy and fake news are more likely to have completed the survey. In

addition, available institutional data shows some possible differences between the sample and the overall population. In 2017, SAIT-wide, 76% of students reported speaking English at home, while the survey reports 79.4% of respondents as speaking English at home. For 2017, internal data at SAIT showed the median age of students in various classifications as 21, 22, 24 and 31 (with the vast majority of students falling into the first three classifications), while the survey data showed a median age of 24.² This reveals a possible selection bias toward older, Anglophone students.

RESULTS

The data were analysed using statistical analysis software. A News Media Literacy score (NML score) was calculated for each respondent through an equal weighting of the answers to the questions in each of the three domains: Need for Cognition (NFC), Media Locus of Control (MLOC), and Knowledge of Media Structures (KMS). In order to generate an overall NML score, the numerical results of each domain was standardized to a four-point scale so they could be equally weighted (Table 1).

Table 1. *Constituent domains of NML scores*

	Number of questions	Unadjusted mean score	Standardized mean score (out of 4)	Standard deviation of standardized mean (σ)	Cronbach’s alpha (α)
NFC: Need for Cognition (Likert Scale 1-5)	5	3.61	2.61	0.67	0.70
MLOC: Media Locus of Control (Likert Scale 1-5)	6	3.55	2.55	0.59	0.66
KMS: Knowledge of Media Structures (Multiple Choice, marked as correct or incorrect)	15	6.43	1.71	0.90	0.80
NML Score (out of 12)			6.88		

Table 2. *News Media Literacy scores*

	n	Minimum	Maximum	Mean	Standard deviation (σ)
News Media Literacy (NML) Score (out of 12)	1476	2.4	11.2	6.88	1.58

² An institutional-wide median age was not available this year from SAIT, due to an analytics system upgrade.

The responses in both NFC and MLOC were corrected by rectifying the reverse-encoded questions, and then generating an overall score from zero to 4 as an aggregation of the Likert scores divided by the number of questions in the section. KMS questions were “marked” as a binary correct or incorrect, and the questions were aggregated and weighted to give an overall KMS score on a scale of zero to four. From these three dimensions (NFC, MLOC, KMS), each corrected to a scale of zero to four, a final News Media Literacy (NML) score out of a possible 12 points was generated. The mean NML score was 6.877, with a minimum of 2.4 and a maximum of 11.2 (Table 2). This NML score was then examined for correlation to each of the hypotheses. A Pearson correlation was used as a test in the case of each hypothesis (Table 3).

For H1 *News Media Literacy scores are correlated with an increased confidence in identifying fake news*, the test question was “How confident are you in your ability to tell the difference between fake news and real news” was used. Respondents answered this question with an average score of 3.56 on a Likert scale of 1 to 5. A Pearson correlation of 0.331 and a $p < 0.001$ indicates a weak but significant correlation between NML scores and a confidence in identifying fake news. Thus, H1 was confirmed.

For H2 *News Media Literacy scores are correlated with positive anti-fake news behaviour*, the test question was “When you share news stories

on social media, how often do you ‘click through’ to read the full story before sharing?” was used. Respondents answered this question with an average score of 3.99 on a Likert scale of 1 to 5. A Pearson correlation of 0.311 and a $p < 0.001$ indicates a weak but significant correlation between NML scores and positive anti-fake news behaviour. Thus, H2 was confirmed.

For H3 *News Media Literacy scores are correlated with positive anti-fake news attitudes*, the test question was “The number of ‘likes’ or popularity of a news item shared on social media increases your perception of how truthful the item is.” was used. Respondents for this reverse-coded Likert question had an average score of score of 2.33 on a scale of 1 to 5. A Pearson correlation of -0.309 and a $p < 0.001$ indicates a weak but significant negative correlation between NML scores and negative attitudes toward fake news. Thus, H3 was confirmed.

For H4 *News Media Literacy scores are negatively correlated with admissions of sharing false information*, the test question was “Have you ever accidentally shared inaccurate information with your friends or followers on social media?” was used. Respondents for this Likert question had an average score of score of 1.93 on a scale of 1 to 5. A Pearson correlation of -0.241 and a $p < 0.001$ indicates a weak but significant negative correlation between NML scores and admissions of sharing false information. Thus, H4 was confirmed.

Table 3. Summary of hypotheses correlations

Question	Mean score on Likert scale (1 to 5)	Standard deviation	Pearson correlation to NML Score	Confidence
H1: How confident are you in your ability to tell the difference between fake news and real news (1=very unconfident, 5=very confident)	3.56	1.00	0.331	$p < 0.001$
H2: When you share news stories on social media, how often do you “click through” to read the full story before sharing? (1=never, 5=very often)	3.98	1.17	0.311	$p < 0.001$
H3: The number of “likes” or popularity of a news item shared on social media increases your perception of how truthful the item is. (1=strongly disagree, 5=strongly agree)	2.33	1.15	-0.309	$p < 0.001$
H4: Have you ever accidentally shared inaccurate information with your friends or followers on social media? (1=never, 5=very often)	1.93	0.83	-0.241	$p < 0.001$
H5: How serious a problem is fake news? (1=very serious, 5=not at all serious)	1.88	0.93	-0.051	$p < 0.001$

For H5 *News Media Literacy scores are positively correlated with a perception that fake news is a problem*, the test question was “How serious a problem is fake news?” was used. Respondents for this Likert question had an average score of score of 1.88 on a scale of 1 to 5. A Pearson correlation of -0.051 and a $p < 0.001$ indicates little correlation between NML scores and admissions of sharing false information. Thus, H5 could not be confirmed.

The two areas previously mentioned as possible indicators of selection bias were examined for significance by examining the dataset with age and language spoken at home as control variables. A Pearson correlation of 0.165 and a $p < 0.001$ indicates a weak but significant positive correlation between age and NML scores (Table 4). A one-way ANOVA revealed a significant relationship between NML scores and language spoken at home, $F(2, 1473) = 26.00, p < 0.001$ (Table 5).

Table 4. *Correlation between age and News Media Literacy score*

	Mean age	Standard deviation (σ)	Pearson correlation to NML Score	Confidence
Age	26.69	9.11	0.165	$p < 0.001$

Table 5. *Language spoken at home and News Media Literacy score*

Language spoken at home	N	Percentage of responses	Mean NML score
English	1177	79.74%	7.02
French	14	0.95%	6.43
Other	285	19.31%	6.29
Total	1476	100%	6.88

DISCUSSION

The results of this study revealed links between an established News Media Literacy instrument and self-reported attitudes and behaviours in news consumption and sharing. The first four hypotheses (H1, H2, H3, and H4) show that a positive NML score is associated with confidence in identifying fake news, with thoughtful news consumption practices, positive news sharing behaviours, and effective news consumption attitudes.

Confidence in identifying fake news is an ongoing challenge. Significant scholarly work has focused on the abilities of individuals – working alone or in organized structures – to identify misinformation (Kim & Walker, 2020; Roitero et al., 2020; Sharon & Baram-Tsabari, 2020). This study contributes to these efforts by establishing a connection between a self-reported confidence in identifying misinformation and in NML scores – which are in turn associated with other positive attitudes and behaviours surrounding fake news. This study also confirms that higher NML scores are associated with a reluctance to share incomplete information (H2) and attitudes that combat homophily in social media contexts (H3).

A valid method of measuring individual susceptibility to fake news has many possible applications. Perhaps one of the most promising is as a self-test tool as part of an educational campaign. Self-test tools have become important instruments in many disciplines including diet, physical fitness and academic preparation (Matsuzawa et al., 2013; McDonald & Boud, 2003; Morgan et al., 2004). Just as a need for a revision in diet could be indicated by taking a self-assessment of one’s eating habits, an increased workout regimen could be indicated by a fitness self-assessment, and an increased focus on a specific area of academic preparation could be indicated by a result on a practice exam, so too could an increased focus on news media literacy be indicated by a self-assessment.

A self-assessment might also be used again at the conclusion of the training as evidence of progress, or some time after the training to determine whether a refresher is needed (Boud, 2013). Institutions might also use this instrument to target groups most in need of news media literacy training.

Several excellent news media literacy training programs exist – including some available without charge to the general public. For example, Stony Brook University, in partnership with the University

of Hong Kong, offers a Coursera online course (Kajimoto et al., n.d.), and the Australian Broadcasting Corporation has been making strides in online courseware for news literacy (Australian Broadcasting Corporation, n.d.). Many of these programs share a conceptual flaw: that people who seek out this training are the very people that have a sufficiently developed internal locus of control to recognize the value of such training. These are likely not the people most in need of instruction.

The ability to measure the overall susceptibility of a population or individual to fake news offers an advance in the development of news literacy programming. As governments and organizations recently have been disbursing grants to news media literacy and factchecking initiatives, these organizations and their grantees may look for concrete evidence of effectiveness beyond the simple delivery of planned programming. They may want evidence of progress toward the goal of an informed and critical news-consuming (and news-sharing) public. Gathering data about improvements in news media literacy is helpful, but now that an NML tool is correlated with positive anti-fake-news behaviours and attitudes, it is much more valuable in demonstrating the effectiveness of a program to funders or participants.

The Stony Brook University news media literacy curriculum has been studied extensively with NML tools, including the MAC2015 instrument (Maksl et al., 2017), endorsing its ability to improve NML scores. Improvements in NML scores from news media literacy training appear to be lasting: the 2017 study showed no indication that the training “wore off” over time (Maksl et al., 2017). The results of this study contribute to that endorsement of the Stony Brook curriculum by associating NML scores with actual behaviours (like link-clicking) beyond the attitudes, belief and knowledge that the MAC2015 instrument measures.

A total of 77.3% of respondents felt that fake news is a “very serious” or “fairly serious” problem with no significant correlation to NML scores. This universal concern among respondents for the fake news problem, regardless of the level of news literacy, indicates an appetite for solutions to the problem of misinformation and disinformation among the survey respondents, and due to the sample size of the survey, this appetite most likely is present among the general post-secondary student population. This perhaps is the most encouraging finding of all: people perceive a problem with the

current relationship between news producers and news consumers. The first step in solving a problem is acknowledging that one exists.

Limitations

No study is without its limitations and this one has a number which will be addressed here. First, this research relies exclusively on self-reported behaviours, which consistently skew the results to perceived “positive” behaviours: people generally report themselves as acting better than they do (Brenner & DeLamater, 2016). In research involving self-reporting, it is difficult to correct for this phenomenon. Second, because respondents were unlikely to have received formal news media literacy training, their self-reported confidence in identifying fake news may be earnest and accurate, but misguided: simply because they report confidence does not mean that they are effective.

Third, there may be a significant non-response bias. Respondents might have been more likely to respond to a survey which interests them, skewing the sample toward those with an active interest in news media, misinformation and disinformation. Comparison with population data revealed that the sample may have overrepresented older respondents, and subsequent analysis showed that older respondents were more likely to have higher news media literacy scores. The sample disproportionately represented Anglophone students versus the general SAIT population, and analysis revealed that those with English as their language spoken at home were likely to have higher NML scores. Finally, the population (post-secondary students at a single polytechnic in Canada) may not be representative of other post-secondary schools, let alone extensions to general populations.

CONCLUSION

Although there are several competing (or complementary) instruments and methods for measuring news media literacy, few of them have been used to specifically measure susceptibility to fake news. This study shows that the MAC2015 scale of news media literacy may be an effective tool to measure not only news media literacy generally, but fake news acumen specifically.

The MAC2015 instrument, though useful, is lengthy and unwieldy to deploy quickly. Future work may include efforts to shorten the MAC2015

instrument through future validation of a shorter survey. In addition, work might be done to examine the converse of the case in this study – that is, do the fake news test questions predict an overall News Media Literacy score? Because of the comparably weak (though significant) correlations in participant responses between the MAC2015 instrument and the additional fake news questions in this study, more refinement and experiments are needed to develop questions with stronger connections to news media literacy in general.

Further research is also needed to validate this instrument in a controlled environment through pre- and post-tests, where respondents are given actual news articles and challenged to identify fake news. Although studies have already been completed with the AMC2013 instrument to validate various news media literacy interventions (Tully et al., 2020; E. Vraga & Tully, 2015), further research on the MAC2015 instrument should focus specifically on attitudes and aptitudes when encountering misinformation and disinformation in the news media and on social media.

An ongoing challenge in news media literacy research may be the proliferation and adaptation of multiple measures of news media literacy. This begins in different interpretations of the concept of news media literacy, and then differing methods in measuring it. Many important studies have brought with them new survey instruments, which in some cases are not used again. This diversity of instruments is a strength in that researchers use these custom-crafted survey instruments to measure precisely which factors they are interested in, but it also makes the results difficult to compare with other work.

As scholarship on news media literacy evolves, one would hope that researchers would consider including at least some common “core questions” in their customized surveys – perhaps from the AMC2013 or the MAC2015 instruments. This would increase the usefulness of the survey work to subsequent analysis by researchers following in their footsteps.

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