HEALTH EDUCATION RESEARCH Vol.26 no.2 2011
Pages 323–335

Media Health Literacy (MHL): development and measurement of the concept among adolescents

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Received on March 13, 2010; accepted on February 3, 2011

Abstract

Increasing media use among adolescents and its significant influence on health behavior warrants in-depth understanding of their response to media content. This study developed the concept and tested a model of Media Health Literacy (MHL), examined its association with personal/socio-demographic determinants and reported sources of health information, while analyzing its role in promoting empowerment and health behavior (cigarette/water-pipe smoking, nutritional/dieting habits, physical/sedentary activity, safety/injury behaviors and sexual behavior). The school-based study included a representative sample of 1316 Israeli adolescents, grades 7, 9 and 11, using qualitative and quantitative instruments to develop the new measure.

The results showed that the MHL measure is highly scalable (0.80) includes four sequenced categories: identification/recognition, critical evaluation of health content in media, perceived influence on adolescents and intended action/reaction. Multivariate analysis showed that MHL was significantly higher among girls ($\beta = 1.25$, $P < 0.001$), adolescents whose mothers had higher education ($\beta = 0.16$, $P = 0.04$), who report more adult/interpersonal sources of health information ($\beta = 0.23$, $P < 0.01$) and was positively associated with health empowerment ($\beta = 0.36$, $P < 0.0005$) and health behavior ($\beta = 0.03$, $P = 0.05$). The findings suggest that as a determinant of adolescent health behavior, MHL identifies groups at risk and may provide a basis for health promotion among youth.

Introduction

Adolescents are spending increasingly more time with media, according to the World Health Organization (WHO) Health Behavior of School Children (HBSC) study, conducted in Europe and North America [1]. Israeli youth rank among the highest of these countries for daily hours of screen time for all ages and ranked in the highest quartiles for reported dieting and lack of physical activity among females, cigarette smoking and reported daily intake of sweetened drinks. Intentional injuries are prevalent among Israeli youth [2].

Substantial research has shown mass media can have both health-compromising and health-promoting effects on adolescents' health behavior. The health-compromising influence of mass media has been studied, among others, with regards to

doi:10.1093/her/cyr007

violence [3], sexual risk behavior [4], obesity [5], body dissatisfaction and eating disorders [6], cigarette smoking [7] and alcohol use [8]. The health-promoting influence of mass media has been attributed to its capacity to provide health information, model health-promoting norms/lifestyles and conduct campaigns for reducing risk behaviors [9]. The ubiquitous role of mass media in everyday life and the accumulated evidence of its significant influence on youth [10], warrants in-depth understanding of how its use can promote or compromise health behavior. Definitions of existing concepts of literacy, health literacy (HL) [11–14] and media literacy (ML) [15, 16] offer theoretical bases upon which a partial understanding can be made regarding the association between the health content youth are exposed to in the media, their understanding and interpretation of the meaning of these messages and their applications of that understanding in their everyday life. HL was defined in the WHO Health Promotion Glossary [13] as 'the development of the cognitive and social skills which determine the motivation and ability of individuals to gain access to understand and use information in ways that promote and maintain good health. By improving people's access to health information and their capacity to use it effectively, HL is critical to empowerment'. This definition takes into consideration not only the functional aspects of HL but also the social determinants of health and literacy. Building on this broader definition of HL and conceptualized from educational research on learning and health promotion [17], Nutbeam [18] offers a model for HL with the following three domains: (i) functional (i.e. transmission of factual information on health risks and services), (ii) critical (i.e. provision of information on social determinants of health and opportunities for communal action to direct change) and (iii) interactive (i.e. opportunities to direct change on a personal level). These domains focus on ways in which information is used to promote and maintain good health.

Functional HL focuses on the communication of information, critical HL focuses on personal and community empowerment and interactive HL on the development of personal skills that promote a supportive environment for health. The importance of developing age-appropriate HL has also been an issue of concern due to developmental differences in all three domains [19]. While this HL model is valuable in understanding the relationships between health content and health behavior, it has not been applied so far systematically and comprehensively enough to mass media as a source of health information. Kickbusch [20] in her analysis of HL, claims that while media are increasingly becoming a source of health information, attempts to improve HL have often failed as the domain of HL empowerment has been neglected.

The independent development of ML theory, curricula and research has also much to contribute to these concerns as it also has been examined for its association with health behavior. ML is defined as the 'ability to access, analyze, evaluate and communicate messages in a variety of forms' [15] While the concept defines the individual's reaction to the media, it has not yet examined an active health-related response to media content. To the best of our knowledge, no published studies have conceptually developed and empirically tested a model for understanding adolescents' understanding, attitudes and active response to the health-related content in the mass media. Related research has mainly focused on a single health topic area (e.g. alcohol use, safe sex) and in one school or community. Neither the concepts and related research on HL, nor on ML, seem therefore comprehensive enough to explain how adolescents interpret health-related content in mass media. Hence, there is a need for a new conceptual framework that integrates the fields of literacy, adolescent health, health behavior and media, providing a basis for a reliable, empirical measure to assess cognitive, attitudinal and behavioral characteristics that explain responses of adolescents to explicit and implicit health-related media content. We suggest that the new concept of Media Health Literacy (MHL) build, in an integrative manner, on the existing theoretical foundations of both HL and ML concepts.

The concept of MHL is based on the premise that the individual has the capability to control the determinants influencing his or her health through

thought and action. The concept assumes that, unlike health content and information intentionally generated by the health system, mass media content is often implicit and can be either health promoting or health compromising. Based on the Nutbeam model of HL [18], yet adapted to media exposure among children and adolescents, MHL is conceptualized as a continuum, ranging from the ability to identify health-related content (explicit and/or implicit) in the media; recognize its influence on health behavior (comparable to functional HL); critically analyze the content (comparable to critical HL) and to express intention to respond through action (personal health behavior or advocacy) (comparable to interactive HL). The proposed measure of MHL is thus comprised of these four categories (Table I). Acknowledging that the relationship between the media and the consumers can be bi-directional, the accumulated media studies research [21] suggests the potential influence of media on influencing knowledge, attitudes and behavior among children and adolescents. They also demonstrate quite persuasively that their use of media is active [22, 23] through selection, negotiation with content, meaning making processes as well as opposition and resistance and to media creation messages [10]. In the case of television diverse media landscape of today, young audiences are influencing the content not only through their tastes and preferences but also through the blurring of the boundaries between producers and consumers of media content on new media platforms. Some youth are also vocal in their attempt to influence media content through activism, advocacy and youth made-media [24].

In this study, we aimed to characterize and measure MHL (Fig. 1). MHL was analyzed with respect to its distribution and association with adolescents' personal/socio-demographic characteristics associated with HL [14] and ML [25], as relevant to characteristics of Israeli adolescents [26]. Reported health status of the individual was analyzed due to its independent influence on health behavior among adolescents [27] and potentially on media-seeking behavior and MHL. Reported personal or media-related sources of health information [28] were investigated in order to illuminate the role of MHL in the wider context of health information sources. Television co-viewing habits [29] with parents, siblings or friends, were analyzed as potential influences on MHL. Empowerment [30, 31] and health behavior were incorporated into the research model in order to elucidate the impact of MHL.

We hypothesized that MHL among adolescents varies according to socio-demographic characteristics, reported sources of health information and co-viewing habits, and that there is a positive association with health empowerment and health behavior.

Methods

The Israeli Ministry of Education research and ethics authorities granted permission to conduct the study. Principals and teachers agreed to the administration of the focus groups and survey in the respective schools and classes, and parents gave passive consent.

The study was conducted in two distinct phases. (Fig. 2).

Phase 1—qualitative research—concept and instrument formulation

The purpose of this phase was to establish the conceptual basis for the major variables in the research model. Firstly, six focus groups (n = 60) were conducted, two each from 7th, 9th and 11th grades, from two schools in different geographic urban areas in central Israel. The participants were selected based on diversity of backgrounds and their expressive abilities as suggested by their teachers. The objectives were to understand the adolescents' perspectives on the meaning of 'health', and on determinants of health and health behavior. The group transcripts were systematically analyzed using grounded theory [32]. Open, axial and selective levels of coding were used to systematize, solidify and refine the patterns of the group data regarding the following themes: definition of health, relevant health topics for youth, factors influencing health, sources of health information, the influence of media on youth health and media with health content.

Table I. *MHL categories*

Category	Description and study question
Identification	Initial identification and recognition of existing health message-the extent to which the adolescent recognizes existing content which is relevant to health in the media to which he is exposed. 'What is the content/message of the segment that you just viewed?'
Influence	Awareness of the potential influence of message on health behavior-the extent to which the adolescent is aware of the potential influence of the message on health behavior of teenagers. 'To what extent do you think viewing of the segment could influence teenagers' behavior?'
Critical analysis	Critical analysis of message-the extent to which critical analysis is expressed by the individual regarding the content to which he or she is exposed. 'To what extent do you agree with the content/message of the segment?'
Action/ reaction	Intention to take action-the extent to which an intention is expressed toward personal and/or social action (advocacy) to be taken as a result of the health-related content in the media. 'What is your personal reaction to the segment?' (No action planned, plans to change or reinforce personal behavior, plans to take public action)

Subsequently, all participants consented to maintain a 7-day media diary, providing information on the popular media among these age groups. Content analysis showed that television was the most frequently medium consumed. Episodes from television programs and corresponding commercial advertisements were scanned by the first author, based on frequency of mention by participants in diaries. The research team reached a consensus regarding which six health-related segments to use in the quantitative phase of the study.

Each of these segments, from programs produced locally and in North and South America, contained contents related either to nutrition/dieting, physical activity, body image, sexual activity, cigarette smoking, alcohol consumption, violent behavior, safety habits and/or friendship and family connectedness, as part of the storyline or behavior of the main actors. Five of the segments portrayed behavior that could directly result in negative health outcomes. The duration of segments ranged from 30 to 75 seconds (Table II).

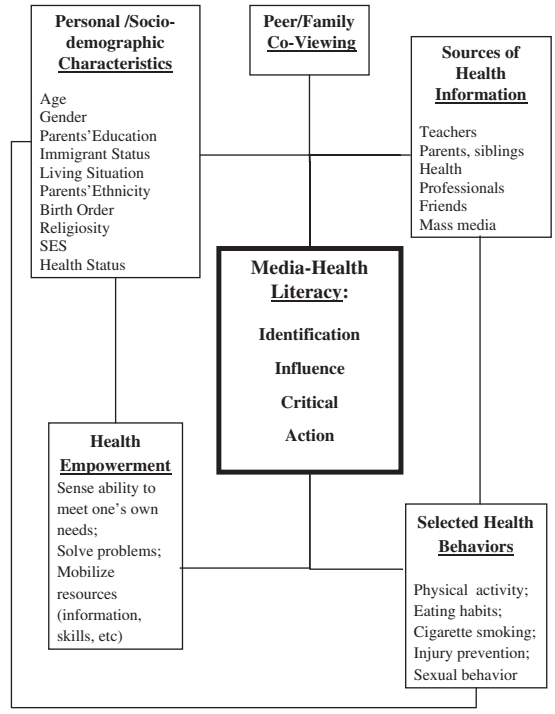

Fig. 1. The research model.

Phase 2—quantitative phase

Study population

The study included a representative sample of 1316 Jewish adolescents, grades 7, 9 and 11 (approximate ages 13, 15 and 17) attending public schools. The sample size required was 1260—420 in each of the three age groups—allowing for at least a 0.8 difference of means of MHL, assuming the standard deviations are not less than 1.5 for 90% power at the 0.05 significance level [33]. The sampling frame was the complete listing of classrooms during the study period, for nine municipalities in central Israel. Probability sampling methods were used to choose the sample schools, through random cluster sampling conducted by classroom. Data were

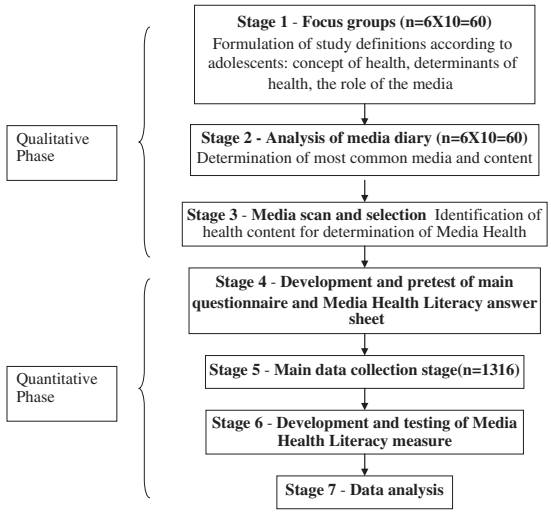

Fig. 2. The study design.

collected from nearly all adolescents (98% response rate) in 57 classrooms from eight schools.

Data gathering

Each participant firstly completed a written questionnaire. Subsequently, six video segments were shown, systematically rotated to eliminate possible biasing of results, and response sheets with questions related to MHL were completed by all participants. The research instruments were administered by the same researcher in all classes, enhancing quality control and reliability. The participants were assured complete anonymity, minimizing response bias.

Instruments and variables

The survey questionnaire, based on the qualitative data gathered in Phase 1, included six parts:

1. Personal/socio-demographic data—self-reported age, gender, immigrant status, birth order, living situation, socio-economic status, perceived socio-economic status, parents′ education, parents′ ethnicity, religiosity and health status.
2. Co-viewing—self-reported use of media with friends, parents, and siblings including television, internet and computer games. Categorized by 'never', 'sometimes', 'often' and 'almost always', coded 0–3 respectively.
3. Sources of health information—divided into interpersonal contact with adult authority (parents, health/education professionals, coaches) and other sources: non-adult (siblings, friends)/media-related (television, internet, radio, newspapers, pamphlets, books). An index was computed for each participant based on the number of health topic areas (cigarette smoking, nutrition, weight control, physical activity, sexual initiation and birth control) for which the individual had at least one adult/interpersonal source of information. It was coded 0 if no adult/interpersonal source was mentioned for the health topic or 1 if at least one adult/interpersonal source was mentioned. Thus, the index used in the analysis ranged from 0 to 6, as there were six health behaviors for which information was elicited.
4. Health empowerment—measured by the Family Empowerment Scale, validated for Israel [34], which measures perceived ability to make decisions on health issues and to implement them, consisting of 23 questions answered on a 5-point Likert scale. The potential, maximum score was 125 (23×5).
5. Health behaviors—self-reported behavior was based on the WHO HBSC questionnaire, adapted to Israel [26]. We computed an overall measure of health behavior from responses to questions regarding cigarette and water-pipe smoking, nutritional and dieting habits, physical and sedentary activity, safety and injury behaviors and sexual behavior. The responses were recoded into sub-categories: positive and negative for each behavior. Positive behavior was defined as: refraining from cigarette smoking and from use of water-pipe; refraining from full sexual relations (7th and 9th grades) or using methods to prevent pregnancy and sexually transmitted disease (11th grade); regularly engaging in physical activity at least 4–6 times per week, less than 4 hours of daily sedentary activity outside of school hours; always using a seat belt while traveling in a car; rarely participating in bullying or never initiating intentional injury; refraining from dieting practice, and

neither regular snacking nor daily use of presweetened drinks. The range of this score was 0 (no health-promoting behavior in any area) to 9 (health-promoting behavior in all nine areas).

6. MHL—This new measure was developed based on responses to a set of six questions completed after viewing each of the six television segments. The questions pertained to the four MHL categories: content identification, perceived influence on behavior, critical analysis and intended action/reaction. The questions on content identification and critical analysis of media segment were open-ended. The content for critical analysis for each participant was analyzed with regard to what content had been identified and subsequently coded into categories and analyzed according to the MHL categories (Table III). Thus, we were able to code for a substantiated critical opinion (whether positive or negative), based on what was initially identified in the media. Each MHL category was scored dichotomously, either 0 (category not present) or 1 (category present). For each of the six segments screened, each participant could have a sum index ranging from 0 (no identification) to 4 (action/interaction mentioned). A score was computed for each segment, which was integrated into a final composite score for each participant, consisting of the sum of the six results. The potential MHL score thus ranged from

Table II. *Television segments chosen for the study*

Television program	Genre and description of segment	Topic of scene	Length of segment (s)
Rebelde Way	Telenovela produced in Argentina, portrays the daily life of a group of youth, boys and girls. A fight breaks out between two groups of boys, in which glass gets broken and one of the boys is injured.	Violence	35
Rebelde Way	Telenovela produced in Argentina, portrays the daily life of a group of youth, boys and girls. The segment depicts a boy apologizing to a girl, after which they kiss.	Relationships/physical intimacy	63
Friends	American situation comedy depicts the daily life of six friends in New York. The segment depicts two males sitting on couch, watching 'Baywatch', commenting on the actress's body and sharing beers.	Sedentary behavior, drinking beer, watching television, viewing program focusing on women's body form	54
Michaela	Telenovela produced in Israel. The segment depicts a mother apologizing to her daughter because the mother had intimate relations with the daughter's friend. The mother is holding a cigarette.	Cigarette smoking, environmental smoking, parents' approval of smoking; relationships	75
Click	Israeli produced advertisement for a candy-bar, styled after a video game.	Violence, social isolation, eating chocolate for comfort	30
That 70's Show	As the program begins, a family is driving in a car and singing the program's theme song.	Lack of use of seatbelts, family cohesiveness	25

Table III. *Summary of questions and coding for MHL categories*

Category	Type of question	Content analysis for closure	Code
Identification/recognition	Open	Segment 1: Rebelde Way-Physical violence/injury, verbal violence, racism/social, personal degradation Segment 2: Friends-Alcohol, body image, physical inactivity, friendship Segment 3: Click-Eating chocolate, eating alone, sharing, violence Segment 4: That 70's Show-Use of safety belts Segment 5: Michaela-Direct and environmental smoking, family relationships Segment 6: HaMordim-Expression of feelings, sexuality, friendship, intimacy	0—No health content mentioned 1—Mention of at least one health topic
Influence	Closed − multiple choice	Not applicable	0—No perceived influence 1—Perceived influence
Critical	Closed + clarification requested through open question	If express disagreement with the content identified, requested to state why as validation/clarification	0—No expressed opinion/criticism relative to content mentioned in identification/recognition category 1—Expressed opinion/criticism relative to content mentioned in identification/recognition category
Action/reaction	Closed, contingent upon previous question	If perceived the message as health compromising, intent to react; If perceived the content as health promoting, intent to adopt/reinforce personal behavior	0—No expressed intention to act/react 1—Expressed intention to act/react

0 (none of the MHL categories were answered positively in any segment screened) to 24 (all four of the MHL categories were positively answered in the six segments screened).

The research instrument was pre-tested among 90 adolescents from four different classrooms in two schools and modified accordingly.

Data analysis

We tested the MHL measure for scalability and reproducibility, based on the Guttman Scale [35], using the PEPI version 4.0 statistical package for data analysis [36]. Scalability is measured using the coefficient of scalability, which is calculated by the coefficient of reproducibility (minimal marginal reproducibility) minus coefficient of reproducibility by chance (CRC), divided by 1-CRC [37, 38].

Internal consistency reliability was tested using Cronbach's alpha.

Analysis of the association between MHL with personal/socio-demographic variables, reported sources of information, and television co-viewing was conducted through analysis of variance. Linear regression multivariate models allowed for measuring the association of MHL with health behaviors and empowerment as dependent variables. The covariates introduced into the models were variables

found to be statistically significantly associated with the health behaviors and empowerment in the univariate analysis ($\alpha = 0.05$). The results of the linear regression analysis are expressed as β coefficient and 95% confidence intervals.

Results

Of the 1316 adolescents in the sample 52% were male, 85% were Israeli born and 81% lived with both parents. About 78% came from middle to high socio-economic status homes, 54% reported their parents had a maximum of 12 years of education and 35% defined themselves as completely secular. Twelve percent reported having a chronic health problem.

Reliability and scalability of MHL

The results showed that MHL had high internal reliability and consistency (Cronbach's alpha = 0.74). The mean score for MHL was 10.12 (SD 3.43, range 0–19). The coefficient of reproducibility was 0.90 for five of the six television segments and 0.84 for the sixth segment. The coefficients of scalability ranged from 0.54 to 0.80. MHL was normally distributed: skewness 0.318 and Kurtosis 0.046.

The MHL scale included four categories that conformed with a Guttman scale with the hierarchy (highest to lowest) as follows: (i) health content identification and recognition, (ii) critical evaluation, (iii) perceived influence on adolescents and (iv) intended action/reaction. Contrary to the originally conceptualized sequence (Table I), the order of critical analysis and perceived influence were reversed.

MHL, socio-demographic characteristics and co-viewing

MHL was significantly higher among girls ($\beta = 1.25$, $P < 0.001$) and among adolescents whose mothers had 15 or more years of education ($\beta = 0.16$, $P = 0.04$) in comparison with those who had less than 12 years of education. MHL was not significantly associated with other socio-demographic variables (immigrant status, parents' ethnicity, birth order, socio-economic status, perceived socio-economic status, living situation and health status), introduced as covariates in the model. Similarly, multivariate linear analysis revealed no significant association between MHL and reported co-viewing habits with parents, siblings or friends.

MHL and sources of health information

The overall mean number of health topics for which adult/interpersonal sources of health information were reported was 4.12 (SD 1.65, range 1–6). MHL was significantly higher among girls ($\beta = 1.13$, $P < 0.001$) who reported a greater number of health information sources ($\beta = 0.23$, $P < 0.01$).

MHL and health empowerment

The overall mean of the empowerment scale was 78.32 (SD 12.35, range 5–111, out of a potential 0–125). The Cronbach alpha coefficient was 0.83; a normal distribution was presented (skewness = −0.639).

The empowerment scale was introduced into the model together with personal/socio-demographic characteristics as potential confounders. The linear regression model showed that for each MHL unit increase, empowerment increased by 0.36 units ($\beta = 0.36$, $P = 0.0005$), controlling for religiosity, age and perceived socio-economic status, which were also positively significantly associated with empowerment (Table IV).

MHL, empowerment and health behavior

The overall mean of the health behavior score for the study sample was 6.32 (SD 1.72, range 0–9 out of 12). In analyzing the association of MHL with health behaviors (Table V), while controlling for empowerment and socio-demographic variables, it was found that for each increase in 1 unit of MHL there was an increase in 0.03 points in the health promoting behavior score ($\beta = 0.03$, $P = 0.05$) controlling for gender, mother's education, living situation and health status, which were independently, significantly associated with health behavior.

Table IV. *Health empowerment by MHL and personal/socio-demographic variables—linear regression analysis*

Health Empowerment					
	β	Standard error	95% confidence interval		*P*-value
			Lower bound	Upper bound	
MHL	0.36	0.10	0.16	0.56	0.0005
Age					0.001
7th grade	4.54	0.84	2.89	6.19	0.00
9th grade	1.05	0.83	−0.58	2.68	0.21
11th grade	0.00				
Gender					0.25
Females	0.83	0.71	−0.56	2.17	0.25
Males	0.00				
Religiosity					0.02
Religious	2.74	1.26	0.26	5.22	0.03
Partly religious	2.55	0.99	0.60	4.50	0.01
Selected traditions	0.37	0.80	−1.20	1.94	0.65
Secular	0.00				
Parents' ethnicity					0.09
Israel	2.97	1.64	−0.24	6.19	0.07
N. Africa + Mid-east	1.78	1.97	−2.08	5.64	0.37
E. Europe + Balkan/FSU	4.19	1.82	0.62	7.76	0.02
America/Canada/Australia	0.00				
Perceived socio-economic status					0.001
Low	−2.98	0.88	−4.71	−1.26	0.00
Average	−2.59	0.85	−4.26	−0.93	0.00
High	0.00				

$R^2 = 0.063$

Discussion

The concept of MHL was developed drawing on theory from two constructs: (i) Nutbeam model for HL and (2) accepted elements of ML, supported by models of empowerment. While drawing from these two conceptual frameworks, MHL adds the specific component of linking and measuring a synthesis of both concepts in a new scale. The identification of a health component in a given media segment, in this case TV, and its categorization into the MHL categories in a dichotomous manner facilitates the use of the scale. The results suggest that MHL is measurable and scalable, distinguishing between levels of MHL and comprised of four distinct scaled categories: (i) identification of health content, (ii) critical analysis and evaluation, (iii) perception of influence on peers′ behavior, (iv) intention to act or react. Critical response ranked higher than perceived influence of the content on behavior of adolescents. This slight digression from the hypothesized sequence could be attributed to the study methodology. The atmosphere of the school setting may have influenced the adolescents, encouraging them to judge the content from an 'educational', more critical perspective. Alternatively, it is possible that while co-viewing the segments with their peers in the school setting, as seen in other studies [39], the adolescents may have perceived that others criticized the media content and, therefore, they did so as well. Yet, we cannot disregard the possibility that the findings of this study regarding sequencing may be valid in other contexts as well.

Table V. *Health behavior by MHL controlling for health empowerment and personal/socio-demographic variables—linear regression analysis*

Health behavior	β	Standard error	95% confidence interval		*P*-value
			Lower bound	Upper bound	
MHL	0.03	0.02	0.00	0.06	0.05
Health empowerment	0.02	0.00	0.01	0.02	0.001
Gender					0.001
Female	0.34	0.11	0.13	0.55	0.00
Male	0.00				
Living situation					0.04
With 2 parents	0.30	0.14	0.02	0.58	0.04
With 1 parent/other	0.00				
Mother's education					0.001
0–12 years	−0.74	0.12	−0.98	−0.50	0.00
13–15 years	−0.20	0.16	−0.51	0.11	0.20
16+ years	0.00				
Health status					0.03
Healthy	0.37	0.16	0.05	0.69	0.03
Chronic health problem	0.00				

$R^2 = 0.072$

The results support most elements of the proposed research model. As hypothesized, MHL was associated with personal/socio-economic determinants, particularly with gender and mothers′ education, independent of other socio-demographic variables. Girls had significantly higher MHL scores than boys among all age groups. In studies on ML, gender has been labeled as the most salient of social determinants among adolescents, noting that females tend to speak more about their viewing experience with others than do males [9, 40]. Research suggests the mere discussion of television leads to better awareness of its content [40]. Possibly, verbalization enhances MHL creating awareness of content, crystallizing an opinion, deliberating about the significance and reflecting upon what can or should be done. The results may also be related to traditional gender socialization beginning at birth and continuing throughout the life cycle [41] making health issues particularly relevant to developing female self-image. Future research could characterize the relationship between gender construction and MHL.

Mothers′ education strongly predicted MHL, explained by the possibility that mothers with higher education are both more health—as well as media—literate, and thus discuss content and critical use of media with their children and planned action or reaction to media content. The study also demonstrated that the greater the number of reported adult/interpersonal sources of health information, the higher the MHL. Parents were the most prevalent sources of information, followed by television, for nearly all health topics. Parents' contribution as a significant source of health information could promote competencies and skills included in MHL, such as critical analysis of the media content concerning information received from parents and other interpersonal sources. Furthermore, these two major sources of information may be combined and enhanced through parents′ television mediation [42, 43]. A study conducted among adolescents after viewing an episode of 'Friends' on condom use found that adult mediation was significantly associated with higher levels of knowledge regarding condom efficacy, in comparison to adolescents who viewed the episode without discussing it with any adult [44]. Discussion of the role of parents is intertwined with the variable of gender since

mothers are still the central caregivers and, as such, tend to be more involved in the socialization of children and in health-related behavior in particular [10]. In this study, reported co-viewing with parents or with others was not associated with MHL in the multivariate analysis. This is interesting in light of the results of recent studies that showed presence or absence of parents while viewing can have a significant influence on the impact of media on children [29]. Our finding may be interpreted in two ways. First, earlier studies on parental mediation focused on younger age groups of early and middle childhood, where parental active co-viewing is more common. Nearly all of the studies conducted up until now have included preschool and elementary school children and their parents, or in the transition from childhood to adolescence. A second contributing factor could be a methodological one, since, it is conceivable that adolescents under-reported television viewing with their parents due to social desirability concerns, as has been found previously [39], reflected on the role of parents from the child's point of view and described how adolescents were inherently hesitant to report about viewing television with their parents. Future studies could have parents report on viewing habits to draw additional conclusions regarding the association of co-viewing with parents and MHL.

As hypothesized, MHL was independently and significantly associated with empowerment when controlling for personal/socio-demographic variables. Kickbusch [20] emphasized the close relationship HL has with the concept of empowerment. The Freirian [45] concept of empowerment suggests three different processes: power to (accomplish), power with (others) and power over (ability to influence and direct other people, or physical/material environment). These processes relate specifically to MHL—reported change in personal health behavior ('power to') and intention to advocate/influence the content of media via writers, producers and policy makers (power 'with' and 'over'). The statistically significant association of MHL with empowerment contributes to the validity of the measure of MHL.

The exposure to mass media and its strong association with a range of health behaviors was one of the specific reasons for embarking upon this study. We examined the association of MHL with nine health behaviors in four overall behavioral categories among adolescents, while other studies analyzed the association between ML and a single health behavior, such as sexual health [44], alcohol use [46] or using a ML scale specifically with regard to smoking [47]. As hypothesized, a statistically significant association was shown between MHL and the health behavior composite score. While MHL was positively associated with health behavior, controlling for personal, social and environmental elements, it is clear from this study that other variables contribute to health behavior as well. Social Cognitive Theory [48] and other models developed to explain health behavior are useful in interpreting this complexity of contributing factors to health behavior, including mass media [49, 50].

In developing the concept and the research instruments of MHL, face, content and consensual validity were analyzed. The face validity of the survey instrument, including the questions used to measure MHL, was discussed in the focus group during the pilot qualitative research phase and distribution of responses to each question in the questionnaire was analyzed during the pretest. The content validity of MHL was analyzed using theory and operational definitions of HL and ML. Furthermore, the study participants were encouraged to write detailed, anonymous responses. As has been shown in other studies [51] on media and literacy, this detail allowed the investigators to code the responses as closely as possible to the intended meaning of each participant.

Among the strengths of this study is the use of combined qualitative and quantitative research methods, facilitating the selection and analysis of media content from the adolescents′ cultural world. Using a variety of popular television genres, produced in three continents, strengthened the MHL concept and research model, enhancing the generalization of the findings. We expect that the MHL will be a useful measurement tool for understanding the role of media in HL. The coding system was developed and refined to categories which allow the MHL measure to be implemented in future

studies in other media-related contexts in which health messages and information are conveyed. We also believe this measure allows easy replication by other researchers interested in this topic of study.

The inclusion of nine health behaviors, similar to national prevalence rates [1] and the representativeness of the sample [52], selected from eight schools across a region, contributed to the strength of the study maximizing the potential for generalization of the results. The sample was large enough to allow for detection of differences in MHL in different subgroups, including a broad range of personal/socio-demographic and other predicting variables, such as health information sources and co-viewing.

The study had several limitations. As the first study to develop and measure the concept MHL, it was based on Jewish urban adolescents in public schools and cannot yet be generalized to all adolescents, such as adolescents from other ethnic populations, those living in rural areas and boarding schools and school drop-outs. While the study was conducted in school classrooms among a large, representative sample in a controlled atmosphere, the school setting may also have enhanced their critical evaluation.

In conclusion, this study was a significant, first step in understanding MHL. As a new concept and measure, further research on MHL is crucial, to support its applicability to other media and among ethnically diverse populations. With the growing popularity of the internet among all age groups, future studies will need to explore its role in the development of MHL. The results of this study suggest that considering MHL as a determining factor of health behavior can contribute to the results of future interventions that promote health behavior. Future research should consider the influence of MHL in achieving outcomes through promoting adolescents′ critical thinking, reasoned choices and active participation in promoting their own health.

Funding

Herzog Institute for Communication Research; Israel Regulatory Agency for Commercial Television; and Hebrew University and Hadassah Medical Center Frieda Paltiel Fund of the Braun School of Public Health Scholarship Fund (Grant # 0463048411).

Acknowledgements

The authors appreciate Ms. Bela Adler's statistical advise, the insightful contributions of Dr Nurit Guttman, Prof. Orly Manor and Dr Daniel Hardoff and thank Ms. Irit Livne and Ms. Tali Kashti from the Israel Ministry of Education and participating school principals, staff and children for their cooperation.

Conflict of interest statement

None declared.

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