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Adaptation and psychometric assessment of a sexual and reproductive empowerment scale in Arabic among refugee and non-refugee adolescent girls

Myriam Dagher¹, Sawsan Abdulrahim^{1*}, Berthe Abi Zeid² and Maia Sieverding¹

Abstract

Background Sexual and reproductive empowerment (SRE) is an important determinant of women's and girls' health yet measuring it is complex due to cultural and domain-specific variations. This study describes the process of adapting an SRE scale consisting of four domains (self-efficacy; future orientation; social support; and safety) and testing its psychometric properties among Arabic speaking adolescent girls in Lebanon.

Methods An SRE scale developed in a Western context was adapted in four steps: (1) reviewing the scale and selecting culturally appropriate domains for translation to standard Arabic; (2) conducting cognitive interviews with 30 11-17-year-old adolescent girls in Lebanon; (3) administering the scale to 339 refugee adolescent girls who participated in an early marriage intervention; and (4) conducting confirmatory factor analysis (CFA) on the data to assess the scale's psychometric properties.

Results The original model for the 13-item, four-domain adapted scale demonstrated poor fit in CFA. After iteratively removing two items, scale properties were improved, albeit were not optimal. The validity and reliability results for the self-efficacy domain were acceptable. Cognitive interview data revealed that Arab adolescent girls understood self-efficacy in relational terms, recognizing that autonomous decision-making is not necessarily favored but is influenced by parents and family.

Conclusions This study presents an effort to customize an SRE scale for use in studies on the health of adolescent girls in an Arab cultural context. Findings from cognitive interviews highlight the importance of taking into consideration relationality in adolescent sexual and reproductive decision-making. The self-efficacy domain in the adapted scale demonstrates acceptable psychometric properties and is recommended for use in health studies to capture SRE.

Keywords Sexual and reproductive empowerment, Adolescent sexual and reproductive health, Cognitive interviewing, Confirmatory factor analysis, Lebanon

*Correspondence:
Sawsan Abdulrahim
sawsana@aub.edu.lb

¹Department of Health Promotion and Community Health, Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon
²Center for Research on Population and Health, Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon



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Introduction

Achieving gender equality and empowering all women and girls is the fifth Sustainable Development Goal [1]. Despite progress on gender equality in some domains, patriarchal structures in many parts of the world continue to disempower women and girls and constrain their opportunities. Empowerment is the process of expanding choice for women and girls so that they can realize their aspirations and exercise more control over their lives and bodies [2, 3]. When women and girls make choices about matters that affect them, they are better able to change systems that disadvantage them and transform gender power relations. A foundational aspect of empowerment is agency, which captures women's and girls' ability to define goals and engage in purposive action to achieve them [4, 5].

Empowerment is both a determinant and an outcome of women's socioeconomic status and social development overall [2, 6]. Thus, the measurement of the construct and its association with maternal and child health in low- and middle-income countries (LMICs) has been the subject of extensive study [7]. Systematic reviews have shown that empowerment is a strong determinant of such health outcomes as fertility and contraceptive use, access to antenatal care, lower child mortality, and child immunization and nutrition [8–10]. Studies on empowerment and women's health in the Middle East and North Africa (MENA) region, where women and girls' gender roles are constrained by rigid cultural and religious norms, have also shown that empowerment is positively associated with contraceptive use and maternal healthcare utilization [11, 12].

Measuring empowerment is complicated by the fact that the concept is multidimensional, complex, and culturally dependent. Conflating empowerment with autonomous and individual decision-making has come under critique; alternatively, empowerment should be understood in the context of the varied forms of constraints that women experience and that are culturally determined [4, 13]. In Bangladesh, for example, where a linguistic equivalent for empowerment does not exist in the local language, Kabeer argued that the concept can be deduced from women's narratives about how to undermine patriarchy [2]. Empowerment can also be domain-specific; women's ability to define goals and exercise choice in terms of economic participation, for example, may be quite different from their ability to do so in terms of their health.

The exercise and measurement of sexual and reproductive empowerment (SRE), the extent to which women make decisions about and exercise control over their sexual and reproductive health (SRH), is complex given varied cultural norms and practices in relation to these domains. SRE of adolescent girls and young women is

particularly contentious given strong taboos around adolescent sexuality and the SRH of unmarried young women in many contexts [14]. There are also measurement considerations specific to empowerment in this age group. Most empowerment assessment tools are not necessarily sensitive to the specific needs of adolescent girls who are undergoing cognitive, emotional, and social changes that influence their sexual identity and transition to adulthood [15, 16]. Furthermore, cross-cultural assessments of SRE among adolescents are highly limited due to the lack of measures that capture agency and decision-making during this developmental stage [17].

A recently published systematic review of the measurement properties of SRH empowerment scales among women identified 15 studies, only three of which utilized a scale that was explicitly developed and validated among adolescents and young adults [18]. Those are the Sexual and Reproductive Empowerment for adolescents and young adults scale [9], the Sexual Relationship Power scale [19], and the Sexual Relationship Power Equity scale [20]. The former was developed and validated among adolescents and young adults in the United States based on Kabeer's definition of empowerment as the expansion of choice. The two other scales were based on Connell's (1987) Theory of Gender and Power, which examines relational agency in the context of gender imbalances in sexual relationships; both scales were used in studies on HIV/AIDS risk prevention in Kenya and South Africa, respectively.

The limited geographic scope of previous studies on SRE in adolescents leaves researchers and practitioners with few options for tools to assess SRH empowerment in other contexts. For example, although there are validated scales that assess Arab women's agency or self-efficacy [10, 21], to our knowledge, there are no measures that capture SRE among women or adolescent girls in the Arab region. This is an important gap for researchers. Despite rising attention to adolescent SRH needs in the region [22–24], little is known about how to measure SRE in a context where societal norms value matrimony as the means of transitioning to adulthood for women and prohibit sexual relations outside marriage.

To address this gap, we adapted an earlier, unpublished version of the SRE scale by Upadhyay and colleagues [9], the Sexual and Reproductive Empowerment Scale for Adolescents and Young Adults (SHREYA) scale [see Additional File 1], to capture change in adolescent girls' sexual and reproductive empowerment in an Arab cultural context. Specifically, the SHREYA scale was adapted for use in the impact evaluation of the Amenah early marriage intervention among Syrian refugee adolescent girls in Lebanon [25]. Amenah is a community-engaged intervention that aims to mitigate the drivers of early marriage among in-school and out-of-school adolescent

Syrian refugee girls through enhancing their access to SRH knowledge and services. A primary long-term outcome of the intervention is to improve gender-based empowerment, which has been shown in myriad studies to mitigate early marriage in LMICs [26, 27]. While the immediate intention of the present study was to develop a scale for use in the Amenah evaluation, we also aimed to produce an SRE scale that would have broad applicability for use among adolescent girls and youth in the Arab region. We describe in this manuscript the results of adapting selected domains from the SHREYA scale through cognitive interviews with Lebanese, Syrian, and Palestinian adolescent girls residing in Lebanon. We also present the results of assessing the psychometric properties of the scale utilizing data from the Amenah evaluation baseline survey.

Methods

The study was carried out in four steps: (1) reviewing the SHREYA scale and selecting culturally appropriate domains for translation to standard Arabic; (2) conducting cognitive interviews with adolescent girls to ensure comprehension of scale items; (3) administering the scale as part of the Amenah evaluation baseline survey; and (4) conducting psychometric analysis on the data to assess the scale's properties and validity for use in the Arab cultural context. The study was approved by the Social and Behavioral Sciences Institutional Review Board at the American University of Beirut, protocol number SBS-2019-0269.

Scale review, domain selection, and translation

In 2019, the authors of this manuscript met with the research team who developed and validated the SHREYA scale to secure permission to translate the scale, and to discuss its domains and possible adaptation (see [Appendix](#)). The authors reviewed and assessed for cultural appropriateness the scale's 24 items under the following seven domains: "bodily esteem, awareness, and autonomy; self-efficacy; future orientation; voice; social support; access to money/resources; and safety." The domains on self-efficacy, future orientation, social support, and safety were retained for translation and further evaluation through cognitive interviews. The domains of bodily esteem, awareness, and autonomy, voice, and access to money/resources were excluded because they included items that explicitly referred to engaging in sexual relationships, which is deemed inappropriate to ask of unmarried adolescent girls in the Arab cultural context. Minor modifications were introduced to the scale items prior to translation. First, the third and fourth items in the future orientation domain were merged as they captured the same meaning. Second, the term "romantic partner" in one of the items in the future orientation

domain was changed to "fiancé or husband" in keeping with cultural norms.

The final set of 13 items in four domains—three in self-efficacy, four in future orientation, three in social support, and three in safety—were first translated to standard Arabic by a bilingual translator. The first and second authors together reviewed the Arabic translation and the English original with a focus on conceptual equivalence between the two versions especially for terms that carry different meanings cross-culturally such as power, control, or safety. An Arabic version that was slightly modified from the original translation was used in cognitive interviews. Following this step, scale items were re-drafted in Levantine colloquial Arabic and the final scale was back translated to English. Table 1 presents the original scale in English (column A), the colloquial Arabic scale (column B), and the back-translated English scale (column C).

Cognitive interviews

There were substantial delays in moving forward with conducting cognitive interviews on the shortened, translated scale due to the political and economic crisis that began in Lebanon in 2019 and the COVID-19 pandemic. Between May and June 2021, a total of 30 11-17-year-old adolescent girls residing in Lebanon (10 Lebanese, 10 Syrian, and 10 Palestinian) were recruited for cognitive interviews through posting announcements in community organizations and on social media. The first author and a research assistant – both of whom are native speakers of Arabic – conducted interviews with the participants over the phone. Recruitment through social media enhanced sample diversity, as was suggested by previous research utilizing the cognitive interviewing method [28], whilst conducting the interviews over the phone facilitated the participation of adolescent girls who would not have been able to conduct the interview in person. The interviews followed the cognitive interviewing method whereby participants are presented with a scale item and guided through a set of questions and probes designed to identify wording and comprehension problems to later correct them; the method improves scale item quality and reduces response errors [29]. Cognitive interviewing allows the adaptation of questionnaire items from one language to another while ensuring comparability. The 30 adolescent girls were guided through a set of comprehension and paraphrasing scripted probes for each one of the 13 scale items. Participants were asked to paraphrase each scale item into colloquial Arabic. Moreover, think-aloud probes (i.e., why do you agree (or disagree) with the item?) were also used to gain a better understanding of the participants' cognitive process.

The interviews were audio-recorded and transcribed verbatim. Analysis progressed through two steps. In the

Table 1 The Arabic SRE scale adapted from the SHREYA scale

Domain	Item	A Original items in English	B Items in colloquial Arabic	C Back-translated items in English
Self-Efficacy	1	I can freely choose if I get married.	أنا فيني اختار بحرية إذا بدي اتزوج أم لا.	I can freely choose if I get married or not.
	2	I can freely choose who I marry.	أنا فيني اختار بحريتي الشخص لبدي اتزوج.	I can freely choose the person I want to marry.
	3	I have the power to control if and when I have children.	أنا فيني قرر إذا بدي جيب ولاد أو لا وامتن ما بدي.	I can decide if I want to have children or not, and when I want.
Future Orientation	4	I can imagine what my future will be like.	أنا بقدر اتخايل كيف رح يكون مستقبلي.	I can imagine what my future will be like.
	5	I have an idea of how I can eventually reach my goals.	أنا عندي فكرة كيف فيني أوصل لأهدافي بالأخر.	I have an idea of how I can reach my goals in the future.
	6	I worry that friends will interfere with me achieving my goals.	أنا بخاف إنو يتدخلوا رفقاتي بتحقيق أهدافي.	I worry that friends will interfere with me achieving my goals.
	7	I worry that someday my fiancé or husband could interfere with me achieving my life goals.	أنا بخاف أنو يوم من الأيام يتدخل زوجي أو خطيبي في تحقيق أهدافي.	I worry that someday my fiancé or husband could interfere with me achieving my life goals.
Social Support	8	I have a parent or guardian who trusts me to make the right decisions.	أنا عندي أب أو أم أو وصي بيوثقوا فيني لأخذ القرارات الصحيحة.	I have a parent or guardian who trusts me to make the right decisions.
	9	I have a parent or guardian who accepts me as I am.	أنا عندي أب أو أم أو وصي بيقبلني مثل ما أنا (أو كيف ما كنت).	I have a parent or guardian who accepts me as I am.
	10	I have a parent/guardian who would help me with my problems and troubles if I needed.	أنا عندي أب أو أم أو وصي الي يساعدني حل مشاكلي إذا كنت بحاجة.	I have a parent/guardian who would help me with my problems and troubles if I needed.
Safety	11	I usually feel safe during the day.	بأغلب الأوقات أنا بحس بالأمان خلال النهار.	I usually feel safe during the day.
	12	I am able to do the things I want to do without worrying about my safety.	أنا فيني أعمل الي بدي ياه بدون ما خاف على سلامتي.	I am able to do the things I want to do without worrying about my safety.
	13	Walking down the street, I feel like my body is my own.	لما امشي بالشارع بحس أنو جسمي محمي من الآخرين.	Walking down the street, I feel like my body is protected from others.

first step, it focused on comprehension and the different ways in which participants paraphrased each item. This helped the researchers to identify linguistic nuances and introduce minor revisions such as adding or replacing words in an item. In the second step, open coding was carried out on the data generated through the think-aloud probes for each item; the open codes were then categorized into themes. This analytical step allowed the researchers to confirm participants' comprehension of the items and capture how their responses were shaped by their individual experiences and context.

Baseline survey and measures

The Amenah baseline survey was administered in early 2022 to 339 11–20-year-old Syrian refugee adolescent girls who were recruited to participate in the Amenah early marriage intervention. Recruitment took place in schools and community organizations in the Bekaa (Eastern) region in Lebanon and through social media channels. The baseline survey instrument included the adapted 13-item SRE scale, girl age, marital status, school enrollment, and other knowledge and attitudinal measures. Age was recorded in years and subsequently coded

into three categories—11–14, 15–17, and 18–20—for analysis. Marital status was recorded as never married, engaged, or married. As the engaged and married categories were small, we combined them in all analyses. School enrollment was coded as enrolled versus not enrolled based on the participant's response to the following question: "Were you enrolled in school for the academic year 2021–2022?" The survey was administered by trained undergraduate and graduate public health university students.

Table 2 presents the Amenah baseline sample characteristics. Over half of participants (58.7%) were 11–14 years old, 37.5% were 15–17, and 3.8% were 18–20. Almost two thirds of the sample (66.1%) was enrolled in school in 2021–2022 and the large majority were not engaged or married (95.3%).

Each item in the SRE scale had three possible response options: 1=do not agree at all, 2=agree a little, and 3=agree a lot. When piloting the survey tool, we found that girls had difficulty responding to Likert-type questions with more than three response categories. The distribution of the responses to the 13 scale items is

Table 2 Demographic characteristics of the Amenah baseline survey participants (N=339)

		N	%
Age	11–14	199	58.7
	15–17	127	37.5
	18–20	13	3.8
School Enrollment (2021–2022)	Enrolled	224	66.1
	Not enrolled	115	33.9
Marital Status	Single	323	95.3
	Engaged/Married	16	4.7

presented in Table 3. We conducted the Confirmatory Factor Analysis (CFA) using this original item coding.

Psychometric analysis

We used CFA to assess the hypothesized relationship between the items in the adapted Arabic SRE scale and the underlying SRE latent constructs (our theoretical model). All CFA models appropriately modeled the ordinal nature of item responses [30]. We hypothesized a four-factor structure following the domains in the adapted scale, with three items in self-efficacy, four in future orientation, three in social support, and three in safety. Table 3 shows which items were expected to load on each of the four factors.

The key question in this analysis is the extent to which the empirical data reproduce the expected relationships between the items and the latent factors specified in the theoretical model [31]. Construct validity – the degree to which scale items accurately measure the corresponding latent construct – was assessed through the goodness of fit of the model. The guidelines for goodness of fit assessment presented by Brown were followed [31]. In addition to an insignificant chi-square χ^2 test, acceptable values of the root mean square error of approximation (RMSEA)

should be <0.08 , with values <0.05 indicating good fit. Lower values of the standardized root mean square residual (SRMR) indicate better model fit, with values less than 0.08 indicating good fit. For the comparative fit index (CFI) and the Tucker-Lewis index (TLI), values >0.90 indicate acceptable fit and values >0.95 indicate good fit, respectively [31]. It is worth noting that the literature recommends some caution in applying standard fit index cut-offs to structural equation models with ordinal data such as ours; however, the general indications in terms of higher versus lower values hold [32].

In addition to the above overall goodness of fit indices, modification indices were examined to assess localized areas of poor fit [31]. Discriminant validity, which indicates that different items in the scale are not redundant, was assessed by examining the correlation between factors. Correlations approaching 1 indicate that the factors have poor discriminant validity [33]. Finally, reliability or internal consistency of the scale and its latent constructs was assessed using Cronbach's alpha, with values greater than 0.70 considered acceptable following common applied practice, although the literature recommends against strict interpretation of specific cutoff values [34]. Analyses were performed using the cfa function of the lavaan package in R [35]. We used the weighted least square mean and variance adjusted (WLSMV) estimator recommended for CFA with ordinal data [31]. There was no missing data on the scale items.

Results

Cognitive interviews

Cognitive interviews were completed with 10 Lebanese, 10 Syrian, and 10 Palestinian adolescent girls who reside in Lebanon. The mean age was 14 (range=11–17) for each of the three nationality groups. Most Lebanese (9

Table 3 Distribution of responses to the 13 scale items, Amenah baseline survey (N=339)

Domain	Item	Item text (English)	Do not agree at all	Agree a little	Agree a lot
Self-Efficacy	1	I can freely choose if I get married	93 (27.4%)	49 (14.5%)	197 (58.1%)
	2	I can freely choose who I marry	64 (18.9%)	65 (19.2%)	210 (61.9%)
	3	I have the power to control if and when I have children	110 (32.4%)	109 (32.2%)	120 (35.4%)
Future Orientation	4	I can imagine what my future will be like	79 (23.3%)	76 (22.4%)	184 (54.3%)
	5	I have an idea of how I can eventually reach my goals	69 (20.4%)	80 (23.6%)	190 (56.0%)
	6	I worry that friends will interfere with me achieving my goals	171 (50.4%)	82 (24.2%)	86 (25.4%)
Social Support	7	I worry that someday my husband or fiancée could interfere with me achieving my	131 (38.6%)	99 (29.2%)	109 (32.2%)
	8	I have a parent or guardian who trusts me to make the right decisions	15 (4.4%)	68 (20.1%)	256 (75.5%)
	9	I have a parent or guardian who accepts me as I am	12 (3.5%)	39 (11.5%)	288 (85.0%)
Safety	10	I have a parent/guardian who would help me with my problems and troubles if I needed	18 (5.3%)	44 (13.0%)	277 (81.7%)
	11	I usually feel safe during the day	19 (5.6%)	108 (31.9%)	212 (62.5%)
	12	I am able to do the things I want to do without worrying about my safety	164 (48.4%)	116 (34.2%)	59 (17.4%)
	13	Walking down the street, I feel like my body is my own	93 (27.4%)	113 (33.3%)	133 (39.2%)

out of 10) and Palestinian (7 out of 10) adolescents were enrolled in school and none were married. By contrast, half of the Syrian adolescents were enrolled in school (5 out of 10) and 3 out of 10 were engaged or married. In this section, we describe the cognitive interview findings, organized by domain, and highlight the linguistic and conceptual revisions introduced to some items to improve their comprehension by adolescent girls.

Self-efficacy

As most adolescent girls who participated in cognitive interviews were young and unmarried, the self-efficacy items relating to decision-making about marriage and childbearing were perceived to be about hypothetical future events. Although the self-efficacy items capture autonomous decision-making, participants evoked without probing the role of parents in their marriage decisions, particularly in interviews with older and married refugee adolescents:

"It [the statement] means that I can choose what I want to do in my future...whether I want to get married or not." (Syrian, 15, Single).

"If the parents really approve of someone [a suitor], they are the ones who make the decision even if the girl doesn't agree to get married." (Syrian, 16, Married).

Based on how adolescent participants paraphrased the items, we introduced minor linguistic revisions to the first and third items to emphasize that the decision is to get married *or not* (item-1) and to have children *or not* (item-3). Another linguistic revision was introduced to item-2 by replacing "who I marry" with a more concrete reference to "the person I want to marry." The think-aloud probing revealed nuanced understandings of the concepts of power and control. Instead of the phrase "I have the power to control" (item-3), participants preferred the terminology of decision-making. Thus, item-3 was revised to read as: "I can decide if I want to have children or not, and when I want."

Future orientation

In speaking about the future, younger adolescent girls (11–12) evoked dreams whilst older adolescent girls (13–17) evoked goals. Both dreams and goals revolved around educational and professional achievements that could be reached through hard work and perseverance.

"I honestly [would] love to be a doctor, so what I do is study well in order to reach this dream in the future." (Lebanese, 12, Single).

"I should work hard on myself and my thoughts to be able to reach my goals." (Palestinian, 15, Single).

In responding to items 6 and 7 in the SRE scale, girls expressed worries that friends or a future fiancé/husband may influence their beliefs and behaviors and interfere with them achieving their future goals. Adolescent girls who were enrolled in school expressed worries that a future fiancé/husband may not allow them to pursue their education or might discourage them from becoming who they wanted, like a doctor or an actress.

A minor linguistic revision was introduced to item-5 based on how it was paraphrased by most participants; as the term "eventually" brought confusion, the item was changed to read "I have an idea of how I can reach my goals in the future."

Social support

No linguistic changes were introduced to the social support items (8–10) as the adolescent girls understood them clearly and paraphrased them with ease. The girls' responses to think-aloud probes for these items further illuminated the importance of considering the influence of parents on girls' agency and autonomy. Girls viewed parental support highly positively and reflected on how their parents stood by their side during difficult situations in school and with friends. In response to think-aloud probes around parental acceptance (item-10), girls linked their parents' acceptance of their character, capabilities, and physical looks with their self-confidence.

In responses to item-8 (about having a parent who trusts them to make the right decisions), some girls perceived that they themselves share the responsibility of maintaining an honest and open relationship with their parents and gaining their trust and support. Thus, parental support in their view is earned and not necessarily provided unconditionally:

"I have parents who trust me to make the right decisions because I don't hide anything from them ... I cannot do anything without taking my parents' approval ... so I earn their trust and they trust me in return." (Lebanese, 17, Single).

Safety

Adolescent girls understood safety as absence of fear and associated daytime with safety and nighttime/darkness with fear. They also associated safety with being healthy. In paraphrasing the item on being able to do things without worrying about one's safety, participants made links to physical and mental health (feelings of happiness or comfort). Moreover, adolescents' attachment to their families was salient to their own sense of safety. Being surrounded by people who provide material and emotional support, such as parents and extended family, generated a feeling of security.

“I feel safe during the day and the night as long as I am with my parents...but I feel alone and not safe when I am without them.” (Palestinian, 17, Single).

In reflecting on the concept of bodily autonomy – captured in the scale item: “I feel that my body is my own” – participants spoke about their bodies as their private property that no one is allowed to touch without their permission. Adolescent girls commonly mentioned that wearing modest clothes that cover their bodies and not smiling in public makes them feel protected from men’s gazes or the risk of being harmed or kidnapped. In a few cases, girls related the concept of bodily autonomy to having a confident and assertive personality, which they also described as assuming a male personality. Thus, item-13 in the safety domain was revised to underscore the notion of being protected from others.

Confirmatory factor analysis

The original CFA model demonstrated poor goodness of fit. The scale reliability was not achieved: the chi-square test for the model was significant ($\chi^2(59)=195.65$, $p<0.001$), both CFI and TLI were below 0.9, RSMEA was 0.083, and SRMR was higher than 0.08 (Table 4, Model 1). The Cronbach alphas for the overall scale and for all domains other than self-efficacy were less than 0.7. Two items in the future orientation domain – item 6, “I worry that friends will interfere with me achieving my goals,” and item 7, “I worry that someday my fiancé or husband could interfere with me achieving my life goals,” had low factor loadings: 0.29 ($p<0.001$) and 0.42 ($p<0.001$), respectively. Examination of the modification indices suggested that the error terms for items 6 and 7, the only negatively worded items in the scale, should be allowed to correlate.

To optimize the validity and reliability of the scale, items that had low factor loadings were then removed iteratively (item 6 in Model 2 and item 7 in Model 3; Table 4). Although Model 2 (12 items) demonstrated improved RMSEA, CFI, TLI and SRMR, the chi-squared test remained significant ($\chi^2(48)=84.62$, $p=0.001$; RSMEA=0.048; CFI=0.957; TLI=0.941; SRMR=0.073).

The reliability of the future orientation domain was not improved by removing item 6 and the factor loading of item 7 remained low (0.28).

Model 3 (which consists of 11 items, after removing item 7 due to its low factor loading) demonstrated only minor improvements in goodness of fit according to all measures [$\chi^2(38)=67.26$ ($p=0.002$); RSMEA=0.048; CFI=0.965; TLI=0.949; SRMR=0.070] but the reliability of the future orientation domain improved (Table 4). Standardized estimates for Model 3 are presented in Fig. 1. All factor loadings in the model were statistically significant. Discriminant validity was acceptable, with the correlations between future orientation and safety (0.52) and future orientation and self-efficacy (0.55) slightly above 0.5. Reliability was acceptable for the self-efficacy domain ($\alpha=0.738$), but not satisfactory for the future orientation ($\alpha=0.608$), social support ($\alpha=0.666$) and safety ($\alpha=0.428$) domains. In sum, Model 3 demonstrated poor goodness of fit overall and only the self-efficacy domain had acceptable reliability.

Discussion

We described in this paper the adaptation and psychometric assessment of an SRE scale for use with adolescent girls in an Arab cultural context. The adapted scale of four domains and 13 items was reduced to an 11-item scale covering all four domains but excluding two items from the future orientation domain. The results show that, although the 11-item scale demonstrated improved psychometric properties compared to the original 13-item one, improvements were minor. The self-efficacy domain is the only subscale that demonstrated acceptable properties. The safety domain demonstrated the weakest properties. Thus, the use of the adapted 11-item scale as a four-factor measure of sexual and reproductive empowerment in an Arab cultural context is not supported. The psychometric results support the cautious use of the self-efficacy sub-scale in future studies to assess adolescent girls’ empowerment related to decision-making about marriage and childbearing.

Qualitative findings based on cognitive interview data provide important insights as to why the scale

Table 4 Goodness of fit statistics for Confirmatory Factor Analysis models and scale reliability measures

Validity/Reliability	Fit statistics	Model 1 (Full scale)	Model 2 (12 items)	Model 3 (11 items)
Construct Validity	χ^2, p	$\chi^2(59)=195.65, p<0.001$	$\chi^2(48)=84.62, p=0.001$	$\chi^2(38)=67.26, p=0.002$
	RSMEA	0.083	0.048	0.048
	CFI	0.852	0.957	0.965
	TLI	0.805	0.941	0.949
	SRMR	0.092	0.073	0.070
Reliability	Cronbach’s alpha	Self-efficacy: 0.738	Self-efficacy: 0.738	Self-efficacy: 0.738
		Future orientation: 0.502	Future orientation: 0.465	Future orientation: 0.608
		Social support: 0.667	Social support: 0.667	Social support: 0.667
		Safety: 0.428	Safety: 0.428	Safety: 0.428

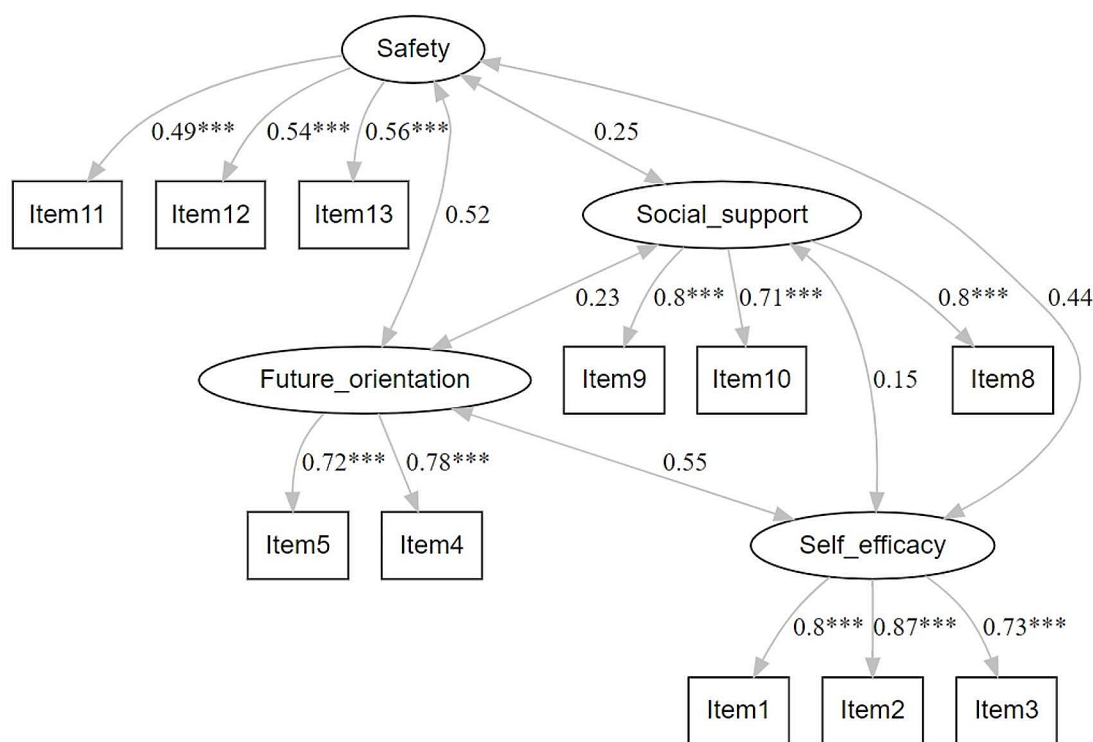


Fig. 1 Confirmatory factor analysis results, Model 3, standardized estimates (11-item scale)

demonstrated weak psychometric properties. For example, during interviews, girls did not seem to capture the concept of future orientation clearly in responding to the two items: “I worry that friends will interfere with me achieving my goals,” and “I worry that someday my fiancé or husband could interfere with me achieving my life goals.” Instead, they responded to the statements by describing how they deal with peer or social pressure in general. This may be why these two items did not correlate with other ones that capture more concretely the concept of future goal setting. Of note, these two items were also not included in the final, published version of the SRE scale [9]. Moreover, the finding that the safety domain demonstrated the weakest psychometric properties is not surprising as the concept of safety is complex and garnered myriad interpretations during cognitive interviews. Specifically, the statement “I feel that my body is my own” was not easily understood and, in some cases, was interpreted as having a strong character.

Although the psychometric properties of the self-efficacy sub-scale were only acceptable, the cognitive interview results further highlight the importance of considering relationality in the ways in which adolescent girls in Lebanon understand self-efficacy, a construct that embodies agency and the belief in one’s capabilities to manage situations and execute the courses of action needed to achieve goals [36]. Although adolescent

participants understood self-efficacy as the capacity to make decisions in matters of marriage and childbearing, their responses also relayed that they are socialized to involve other members of their families, mainly parents, in decisions on intimate matters. Joseph (1993) developed the concept of relational connectivity, or seeing the self through its relationship with others, as a framework for understanding relationship dynamics in Lebanese families. Relational connectivity highlights the centrality of the family in Arab culture, whereby boundaries between the self and other family members are fluid and decision-making is not an individual process but is a collective family affair [37]. This finding raises the question as to whether parental or extended family involvement in adolescent girls’ decision making may reinforce patriarchal norms that stymie agency and contribute to negative adolescent SRH outcomes.

The study highlights some of the methodological challenges of developing SRH empowerment scales for use among adolescents in different cultural contexts. While there can be great comparative value in using the same scale across different countries and populations, as we attempted to do, this can be in tension with local contextualization. This was a particular challenge given that existing SRH empowerment scales for adolescents were developed in contexts where pre-marital sex is less stigmatized and/or HIV prevalence is higher than in the

Arab region. To develop a stronger SRH empowerment scale for adolescents in the region, it may be better to begin from localized, qualitative research and from the starting point of developing different scales for married versus unmarried adolescents. Important dimensions around intimate relationships could then be captured in a scale specifically for married adolescents while maintaining cultural relevance and appropriateness.

Relatedly, one of the limitations of the present study is that it utilized the SRE scale as a starting point and merely removed or modified (prior to cognitive interviews) some of the items on sexual autonomy and decision-making due to cultural inappropriateness. This process resulted in a shortened scale that may not have captured complex constructs of empowerment and autonomy among adolescent girls in an Arab cultural context. Whilst cognitive interviews helped refine existing items in the shortened scale linguistically speaking, in-depth qualitative formative research might have illuminated new concepts and dimensions of girls' empowerment and expanded the scale. For instance, a recent adaptation and validation of the same SRE scale in an East African context conducted in-depth interviews that resulted in increasing the initial number of items in the adapted scale from 23 to 32. The final scale, based on CFA, demonstrated good psychometric properties [38]. Another limitation of this study is the young age of the adolescent participants in both the cognitive interviewing (average age=14) and survey data utilized in the psychometric analysis (58.7% are 11–14 years old) in comparison to the 15–24 age range for which the original SRE scale was developed. Girls younger than 15, many of whom have not reached puberty yet, may not have developed the language around such concepts as empowerment, autonomy, or self-efficacy. Although the study presents an effort to customize a sexual and reproductive empowerment scale to use in SRH studies in an Arab cultural context, additional research is needed. To develop a culturally sensitive scale, we propose that researchers begin with a qualitative study based on grounded theory, match the resulting themes with the SRE scale items, and add new items and domains to an expanded scale prior to conducting cognitive interviews and testing the scale's psychometric properties.

In conclusion, the findings from our psychometric analysis demonstrated weak properties of the adapted four-factor scale, which was not supported for use. We found only acceptable reliability of the self-efficacy sub-scale (3 items). The qualitative cognitive interview data reveal that adolescent girls' decision-making in an Arab cultural context is not an individual activity but a relational process that involves parents. Adolescent participants not only stated the importance of their parents' opinions in shaping their life decisions but also highlighted that their

identity, self-worth, and sense of security are very much tied to their relationships with their parents. Thus, the findings from cognitive interviews add complexity to the meaning of adolescent empowerment in cultural contexts where individuation and autonomous decision-making are not necessarily desired and where child-parent connectivity is favored [39]. These findings serve as a starting point for future research designed to develop a scale that captures SRE among adolescent girls in an Arab cultural context.

Abbreviations

CFA	Confirmatory factor analysis
CFI	Comparative fit index
LMICs	Low- and middle-income countries
MENA	Middle East and North Africa
r	Pearson's Correlation Coefficient
RMSEA	Root mean square error of approximation
SHREYA	Sexual and reproductive empowerment scale for adolescents and young adults
SRE	Sexual and reproductive empowerment
SRMR	Standardized root mean square residual
SRPS	Sexual relationship power scale
TLI	Tucker-Lewis index
WLSMV	Weighted least square mean and variance adjusted
α	Cronbach's alpha
χ^2/df	Relative chi-square/degrees of freedom

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

MD prepared study IRB materials, collected and analyzed cognitive interview data, coordinated baseline survey data collection and management, and contributed to the writing of the manuscript. SA is the PI of the Amenah early marriage intervention for which this scale development study was carried out; she conceptualized the study, supervised data collection, analysis, and write-up of results, and contributed to the writing and revision of the manuscript. BA conducted psychometric analysis. MS is co-PI of the Amenah early marriage study; she supervised psychometric data analysis and contributed to the writing of the manuscript. All authors reviewed and approved the final draft before submission.

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Data availability

Data from the study are not publicly available until the researchers publish the main findings of the study. However, data can be shared with the journal upon reasonable request. Cognitive interview data are available de-identified in transcript format in Arabic. Baseline survey data used in confirmatory factor analysis are available in a Stata file (in English).

Declarations

Ethics approval and consent to participate

Ethical approval for the cognitive interviewing study and the Amenah Early Marriage intervention study was granted by the American University of Beirut Social and Behavioral Sciences Institutional Review Board, Protocol number: SBS-2019-0269. Informed consent was obtained from all participants and their legal guardians. The authors confirm that all experiments were performed in accordance with relevant guidelines and regulations (such as the Declaration of Helsinki).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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