Journal of Adolescent Health xxx (2020) 1–9

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

A Cross-Country Network Analysis of Adolescent Resilience

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Article history: Received February 28, 2020; Accepted July 8, 2020
Keywords: Social–ecological resilience; Systemic resilience; Network analysis; Cross-country

A B S T R A C T

Purpose: In situations of adversity, young people draw on individual, relational, and contextual (community and cultural) resources to foster their resilience. Recent literature defines resilience as a capacity that is underpinned by a network of interrelated resources. Although empirical studies show evidence of the value of a network approach, little is known regarding how different country contexts influence which resources are most critical within a resource network and how resources interact for adolescent resilience.

IMPLICATIONS AND CONTRIBUTION

Resilience draws on a network of interrelated resources whose relations vary across countries. Caregiver support has been identified as the

Conflicts of interest: The authors have no conflict of interest to declare.

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https://doi.org/10.1016/j.jadohealth.2020.07.010

Methods: Network analysis was conducted with data from studies that had used the Child and Youth Resilience Measure. Regularized partial correlation networks of 17 resources were estimated for 14 countries (Botswana, Canada, China, Colombia, Equatorial Guinea, India, Indonesia, Italy, Jordan, New Zealand, the Philippines, Romania, South Africa, and Syrian refugees living in Jordan). The sample size was 18,914 (mean age = 15.70 years, 48.8% female).

Results: We observed mostly positive associations between the resources of interest. The salience and strength of associations between resources varied by country. The most central resource across countries was having supportive caregivers during stressful times because this resource had the most and strongest positive associations with other resources.

Conclusions: This study gives first empirical evidence from multiple countries that an interplay of social–ecological resources (such as individual skills, peer, caregiver and community support, and educational aspirations and opportunities) matter for adolescent resilience. Across countries, caregiver support appears to be most central for adolescent resilience. Future resilience interventions might apply this network approach to identify important, contextually relevant resources that likely foster additional resources.

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most important resource to have access to other meaningful resources across countries. Resilience interventions should aim at fostering such central resources in addition to the most protective resources.

Resilience is defined as the capacity of individuals and collectives (such as families and communities) to navigate to and negotiate for meaningful social–ecological resources (e.g., caregivers, peer groups, or institutional supports) that can protect their well-being and development in times of stress [1]. Resilience relies, therefore, on personal strengths as well as the resources that are provided by a facilitative environment [2]. Which personal strengths and assets are available and used is influenced by the ecological context an individual lives in (such as cultural values or sociostructural characteristics of a community or country) [3,4]. Furthermore, these resources do not function in isolation. Resilience is promoted by dynamic processes of interaction between personal strengths and relevant ecological resources that help individuals and collectives to successfully deal with a specific stressor [2,5]. For example, child and youth resilience across diverse stressful contexts relies on a mixture of rearing practices by caregivers, social relationships and responsibilities, available protective institutions such as schools or places of worship, and personal strengths such as self-efficacy, cognitive skills, and competence [5,6].

This dynamic, ecological systems theory conceptualizes resilience as a network of mutually dependent, interacting resources from different systems such as psychological, social, institutional, cultural, and environmental [7,8]. Resources are thought to influence each other in several ways. The accessibility and quality of resources can depend on other resources (e.g., caregivers with higher socioeconomic status can give their children access to higher quality education if it is provided by societal institutions). Resources can be positively related and reinforce each other (e.g., children learn social skills from their caregivers and peers; these social skills attract positive responses from caregivers and peers) or they can be negatively related and hinder each other (caregivers who deny children contact with peers or access to education). This network perspective adds novel characteristics: it draws attention to how interconnected a resource network is and which resources are most influential on other resources in a resilience network [9]. This may help to better design resilience interventions: from solely improving or sustaining protective resources to also targeting the resources that exert (the most) positive influences on other resources.

With the emergence of network analysis (NA) [10], recent studies have been able to examine not just resources but networks of resources. For example, a study with adolescents from the United Kingdom showed that experiences of early life adversity can lead to negative interactions between personal and ecological resources and associated negative mental health effects [11]. Furthermore, a study with a population sample of university students in Belgium showed that psychological and familial resources are generally positively related [12].

How resources are related to each other, however, could be significantly influenced by specific social contexts, such as the community in which a young person grows up [13]. When communities prioritize specific resources over others, they influence resource availability and accessibility and potentially which resources matter more, or less, for resilience [3,14]. Caution is, therefore, necessary when generalizing the importance of resources for the functioning of a resilience network within different ecological levels (across communities, countries, or cultures). Thus, although there are resources that are common across different cultures at different levels of stress exposure [15,16], the context has the potential to influence resilience networks by impacting the importance, availability, and interrelatedness of these resources [13].

Meaningful Resources for Adolescent Resilience Across Countries and Contexts

A social–ecological model of resilience also stresses that the developmental period influences which resources are available and used in stressful circumstances [17]. A multicountry study identified resources that are meaningful to the resilience of adolescents across nations and for manifold stressful contexts such as war, poverty, dislocation, and marginalization [15,16]. This resulted in the culturally and contextually sensitive *Child and Youth Resilience Measure* (CYRM-28) that assesses resources on the individual (personal and social skills and peer support), caregiver (psychological and physical caregiving), and contextual levels (spirituality, education, and culture) [15]. However, follow-up studies found that the measured resources might not operate equivalently across different countries [18–20]. This indicates

structural and processual differences in resilience networks between countries.

The present study

Few empirical studies have investigated the network of resources that support adolescent resilience or considered how specific country contexts influence the characteristics of resource networks. The present study aims to use NA to compare the same network of individual and social–ecological resources across different countries to identify country-specific as well as common characteristics of adolescent resilience networks (e.g., which resources are positively/negatively related and which resources have the most associations with others).

Methods

Measures

The analysis was based on the CYRM-Revised (CYRM-R) [21], which is a 17-item Rasch-validated revision of the widely used CYRM-28 measure [15]. The CYRM-R assesses cross-culturally meaningful resilience resources of young people for manifold stressful situations and consists of two subscales: intra/interpersonal resilience and caregiver resilience (Table S1 provides reliability statistics). Intra/interpersonal resilience relates to internal skills as well as resources of the environment, such as peers, school, or learning opportunities. Caregiver resilience relates to psychological and physical resources provided by caregivers, such as safety, nutrition, or support. The measure can be administered with a three- or five-point Likert-scale. The data analysis for the present study was based on the five-point Likert-scale. One data set for India with 62 participants (Table S1) had used the three-point Likert-scale and was linear transformed to a five-point Likert-scale (1 remained 1, 2 into 3, and 3 into 5). Higher scores indicate higher resilience.

Procedure

The CYRM-R is a free tool and can be accessed via the homepage of the Resilience Research Centre (www.resilienceresearch.org). To download the CYRM-R, users are asked to give their contact information. E-mail addresses were used to contact anyone who had accessed the CYRM up to mid-April 2019 and used it to study children and youth that live in stressful circumstances. Hence, the risk was implicitly included in the current analysis by the characteristics of each sample. Data sets from the same country were merged for ease of analysis, thereby operationalizing social context as a country-specific condition. By the time the data sets were collected, a total of 43 studies that have used the CYRM were published in scientific journals. This analysis included a total of 23 data sets from 16 different principal investigators from 14 countries, of which not all had published their data (Table S1 provides each sample's details).

Each respective study that was included in this analysis was approved by the institutional review board of each study author's institution where the original study was conducted.

Data analysis

Individuals with missing data were excluded from the analysis (Table S2 provides characteristics of the included and excluded participants). The present analyses were performed using *R* version 3.6 in *RStudio* 1.2.1335 (R Core Team, Vienna, Austria).

The goldbricker method was used to test for topologically overlapping items before the network models were estimated using *networktools* [22]. Overall, eight countries showed no overlapping items, whereas six countries showed country-specific overlapping items (see R-script for results). Hence, to be able to compare the countries, no items were merged.

Network estimation. NA shows significant conditional associations between all resources in a network [10,23]. By controlling for the influence of all other resources, it indicates what unique association exists between two resources, how they are related (valence), and how strong this relation is (weight). Although a network model based on cross-sectional data (as in the present analysis) does not imply causal influence, it can serve to form hypotheses about causal relationships.

Regularized partial correlation networks were estimated for each country using *EBICglasso* in *bootnet* [24]. The *huge* method was applied because multivariate normality was not given (Figure S1). The tuning parameter for EBIC (Extended Bayesian Information Criterion) was set to lead to the network with the highest possible specificity for each country. Networks were visualized using *qgraph* [25].

Network inference. Expected influence (EI) centrality is related to strength centrality and indicates the importance of a resource for the structure and functioning of the network [26]. It is based on the sum of all regularized partial correlations/edge weights of a resource to its connected resources. EI, therefore, indicates if a resource has an overall activating (more positive than negative connections) or deactivating (more negative than positive connections) influence on a network. Resources with a high negative or positive EI have a high importance for a network. A study by Epskamp et al [24] has shown that strength centrality (and thus EI) is the most reliable indicator of the commonly investigated centrality indices next to closeness and betweenness centrality. For this reason, this study focused on EI centrality. Analyses of the other centrality indices can be found in the Supplemental Material (Figure S2). Furthermore, the *average predictability* of a whole network was estimated to indicate how well a network can predict itself and how much it is dependent on unknown variables via *mgm* [27].

Network comparison. A moderated network model was estimated via glasso and EBIC to examine differences between two networks by analyzing how many edge weights significantly differed between each pair of country networks [27]. To get an insight into how similar the countries were in the importance of each resource for the interrelatedness and functioning of the network, correlations were used to compare their EI profiles [9]. Also, an average network was estimated by averaging the edge weights and node EI centralities across all country-specific networks [9]. In addition, a variability network across the included countries was estimated where each edge and node represent their standard deviation (SD) in edge weight and EI across all networks [9]. This gives an insight into where the included samples show the most differences and similarities.

Network stability. To estimate the accuracy of the edge weights, 95% bootstrapped confidence intervals were derived (for results, see Figure S3) [24]. Second, the stability of EI was indicated via case-dropping subset bootstraps and the correlation stability coefficient (for results, see Figure S4). These measures indicate if the order of the EI of the resources remains the same in a network that is based on a smaller sample. The correlation between the original sample and a subset should preferably be above .5 and at least .25 [24]. The EBIC tuning parameter needed to be lowered for the six countries with the smallest sample sizes to conduct this analysis (see R-script). These analyses were conducted using *bootnet* [24].

In summary, NA results mainly in descriptive metrics that are used to describe the characteristics of a network. The network estimation identifies edges that are meaningful for the network independent of how much they differ from each other.

Results

Descriptive statistics

The overall sample consisted of 18,914 participants, with 48.8% of females and a mean age of 15.70 years (SD = 3.37). There was a large variance in the sample sizes for the 14 countries, ranging from $n = 200$ for Romania to $n = 3{,}868$ for Italy (Table 1 and Table S1 provide more details on included data sets). Most samples had a lower percentage of females. The country that scored highest on resilience-enabling resources was Botswana, followed by Colombia and India. The countries with the lowest resources were Equatorial Guinea, Italy, and Indonesia. Botswana, Colombia, Equatorial Guinea, and Italy showed significant differences to all other countries in relation to their overall resource level, whereas the other countries showed similar levels.

As can be seen in Table 2, the most commonly reported available resource on average was I2 ("Getting an education is important to me," $M = 4.47$,) and the least commonly reported available resource was C4 ("I talk to my caregiver(s) about how I feel," $M = 3.36$). Country-specific distributions of resources were also present (Table S3), and the resource profiles of two countries correlated on average by $r = .44$ (Table S4).

Cross-country network of resilience

Edge weight. Figure 1A shows that all edges were positive on average, and the strongest association (edge weight = .37) was found between "I feel supported by my friends" (I5) and "My friends stand by me during difficult times" (I7). The second strongest association (edge weight = .23) was found between "My caregiver(s) stand(s) by me during difficult times" (C5) and "I feel safe when I am with my caregiver(s)" (C6).

Expected influence. On average, the resources with the highest EI were C5 ("My caregiver(s) stand(s) by me during difficult times"), C6 ("I feel safe when I am with my caregiver(s)"), and I7 ("My friends stand by me during difficult times") with standardized EI estimates of 1.41, .75, and .68, respectively (Figure 1B). The resources C3 ("If I am hungry, there is enough to eat"), I2 ("Getting an education is important to me"), and I4 ("People think I am fun to be with") showed the lowest standardized EI with estimates of −1.03, −.77, and −.69.

The average predictability of the entire network was $R^2 = .26$.

Country-specific resilience networks

Edge weight. Figure 2 indicates that the edge connecting I5 ("I feel supported by my friends") and I7 ("My friends stand by me during difficult times") showed a moderate to strong connection for most networks except for Romania where no connection was estimated and for Jordan and Indonesia where rather weak connections were estimated. Also, an edge that showed a relatively moderate connection in all countries apart from Equatorial Guinea was the one between C5 ("My caregiver(s) stand(s) by me during difficult times") and C6 ("I feel safe when I am with my caregiver(s)"). An edge that showed one of the lowest connections for all countries was the one between C3 ("If I am hungry, there is enough to eat") and C4 ("I talk to my caregiver(s) about how I feel"), whereas an edge that showed a high variability across countries was the one connecting I2 ("Getting an education is important to me") and I6 (I feel I belong at my school). These resources were connected in all countries but weakly in South Africa and India, moderately in Botswana and Canada, and strongly in Jordan, China, and New Zealand.

Table 1
Sample characteristics

Country	N	Age, M (SD) [Range]	Gender (%♀)	Intra/interpersonal resilience, M (SD)	Caregiver resilience, M (SD)	CYRM-R total, M (SD)
1. Botswana	511	14.88 (1.14) [12–19]	44	45.81 (4.91)	32.13 (3.69)	77.9 (7.60)
2. Canada	3,090	15.47 (2.47) [11–25]	51.9	41.68 (5.96)	28.92 (5.81)	70.61 (10.39)[6,9]
3. China	1,425	16.09 (1.62) [13–19]	57.4	40.58 (6.13)	28.87 (5.67)	69.45 (10.08)[9,12,13]
4. Colombia	1,315	15.82 (1.84) [13–19]	50.1	42.99 (4.64)	30.18 (4.40)	73.18 (7.51)
5. Equatorial Guinea	353	12.54 (1.95) [10–16]	53.8	37.35 (5.87)	24.86 (4.63)	62.21 (9.10)
6. India	966	15.12 (1.21) [12–19]	50.4	41.37 (5.21)	29.48 (4.64)	70.86 (8.61)[2,9]
7. Indonesia	801	10.88 (0.89) [10–14]	47.8	38.44 (7.44)	27.9 (5.47)	66.33 (12.03)[11,14]
8. Italy	3,868	16.68 (1.44) [14–21]	41.3	37.45 (5.67)	26.5 (5.49)	63.96 (9.77)
9. Jordan	272	14.32 (1.62) [11–19]	41.2	40.71 (6.30)	29.82 (4.27)	70.53 (9.32)[2,3,6]
10. New Zealand	1,186	15.08 (1.23) [12–17]	39.2	40.26 (5.84)	27.23 (6.00)	67.49 (9.79)[11,12,14]
11. The Philippines	825	19.97 (1.03) [17–23]	63.5	40.42 (4.83)	26.82 (4.36)	67.24 (8.21)[7,10,12,14]
12. Romania	200	12.54 (1.59) [9–17]	46.3	40.57 (6.25)	28.16 (4.35)	68.72 (9.89)[3,10,11,13,14]
13. South Africa	3,807	15.60 (2.21) [11–26]	53.4	39.68 (7.06)	29.55 (5.48)	69.23 (11.10)[3,12]
14. Syrian refugees living in Jordan (Syria)	295	14.06 (1.89) [10–19]	40.3	38.39 (6.77)	28.92 (4.33)	67.31 (9.67)[7,10,11,12]
Total	18,914	15.70 (3.37)	48.8	40.08 (6.35)	28.44 (5.53)	68.52 (10.47)

CYRM-R = Child and Youth Resilience Measure-Revised; M = mean, SD = standard deviation.
Superscript numbers refer to the country with nonsignificant differences in CYRM-R total score ($p > .05$).

Table 2
CYRM-R item characteristics across countries

Short name	Item	M_{Score} (*SD*)	M_{EI}	Highest score per country	Highest centrality per country
I1	I cooperate with people around me	3.95 (1.02)	−.05		
I2	Getting an education is important to me	4.47 (.90)	−1.18	BWA, COL, GNQ, IND, PHL, ZAF	
I3	I know how to behave in different social situations	4.12 (1.01)	−.85		
I4	People think I am fun to be with	3.92 (1.06)	−1.07		
I5	I feel supported by my friends	3.93 (1.13)	1.03		
I6	I feel I belong at my school	3.80 (1.23)	.20		
I7	My friends stand by me during difficult times	3.87 (1.17)	1.13		JOR, PHL, SYR
I8	I am treated fairly in my community	3.88 (1.15)	.08	ROU	IDN
I9	I am given opportunities to show others that I am becoming an adult and can act responsibly	3.98 (1.07)	−.06		
I10	I have opportunities to develop skills that will be useful later in life (like job skills and skills to care for others)	4.15 (1.02)	.18		
C1	My caregiver(s) watch me closely	4.07 (1.15)	−.71	JOR	
C2	My caregiver(s) know a lot about me	3.90 (1.23)	.49		
C3	If I am hungry, there is enough to eat	4.38 (1.00)	−1.68	CAN, ITA	
C4	I talk to my caregiver(s) about how I feel	3.36 (1.44)	−.54		
C5	My caregiver(s) stand(s) by me during difficult times	4.20 (1.12)	2.21		BWA, CAN, CHN, GNQ, IND, ITA, ROU, ZAF
C6	I feel safe when I am with my caregiver(s)	4.44 (.96)	1.15	CHN, IDN, NZL, SYR	COL
C7	I enjoy the family traditions of my caregiver(s)	4.09 (1.17)	.14		

I = items of the intra/interpersonal resilience subscale; C = items of the caregiver resilience subscale; M_{Score} = average item score; SD = standard deviation of average item score; M_{EI} = average standardized expected influence; BWA = Botswana; CAN = Canada; CHN = China; COL = Colombia; GNQ = Equatorial Guinea; IND = India; IDN = Indonesia; ITA = Italy; JOR = Jordan; NZL = New Zealand; PHL = The Philippines; ROU = Romania; SYR = Syria; ZAF = South Africa.

All networks showed significant differences in their edge weights, and thus, no two countries showed the same network (Table 3). On average, 15.01% of edges significantly differed between the countries. South Africa showed the most different edge weights to all other countries ($M = 23.38\%$) followed by Italy ($M = 20.00\%$), and Equatorial Guinea ($M = 17.23\%$), whereas Syria ($M = 7.92\%$), Jordan ($M = 9.54\%$), and Romania ($M = 10.15\%$) showed the least. Figure 1C gives an overview of how much the edge weight of each edge varied across all countries. The edges that differed the most between the countries were between I5 ("I feel supported by my friends") and I7 ("My friends stand by me during difficult times"; $SD = .16$), between I2 ("Getting an education is important to me") and I6 ("I feel I belong at my school"; $SD = .13$), and between C2 ("My caregiver(s) know a lot about me") and C4 ("I talk to my caregiver(s) about how I feel"; $SD = .11$).

Expected influence. Figure 1B indicates that the resources differed in their EI between countries, whereas others were also similar (Figure S3 shows the country-specific standardized and unstandardized centrality profiles). The countries with the most similar EI profiles were Canada and the Philippines ($r = .79$), India and China ($r = .77$), and New Zealand and Colombia ($r = .75$); whereas South Africa and Jordan ($r = -.30$), New Zealand and Jordan ($r = -.27$), and Colombia and Jordan ($r = -.20$) showed the most differences (Table S5).

Although C5 ("My caregiver(s) stand(s) by me during difficult times") was found to be the most central resource for most countries, for Philippines, Romania, and Syria, it was I7 ("My friends stand by me during difficult times"), for Indonesia I8 ("I am treated fairly in my community"), for Colombia C6 ("I feel I belong at my school"), and for Jordan I6 ("I feel I belong at my school"). Also, the least central resource for Equatorial Guinea and India was I4 ("People think I am fun to be with"), for Jordan and Romania I2 ("Getting an education is important to me"), for Indonesia and South Africa C4 ("I talk to my caregiver(s) about how I feel"), and for Botswana and Equatorial Guinea C1 ("My caregiver(s) watch me closely"), whereas C3 ("If I am hungry, there is enough to eat") was the least central resource for the remaining countries. Figure 1C gives an overview of how much each node's EI varied across all countries. The resources with the highest EI SDs were C1 ("My caregiver(s) watch me closely," 1.15), C3 ("If I am hungry, there is enough to eat," .97), and C6 ("I feel safe when I am with my caregiver(s)," .88).

The average predictability ranged from .08 for Equatorial Guinea to .38 for Canada (Figure S2 provides average predictability of all countries).

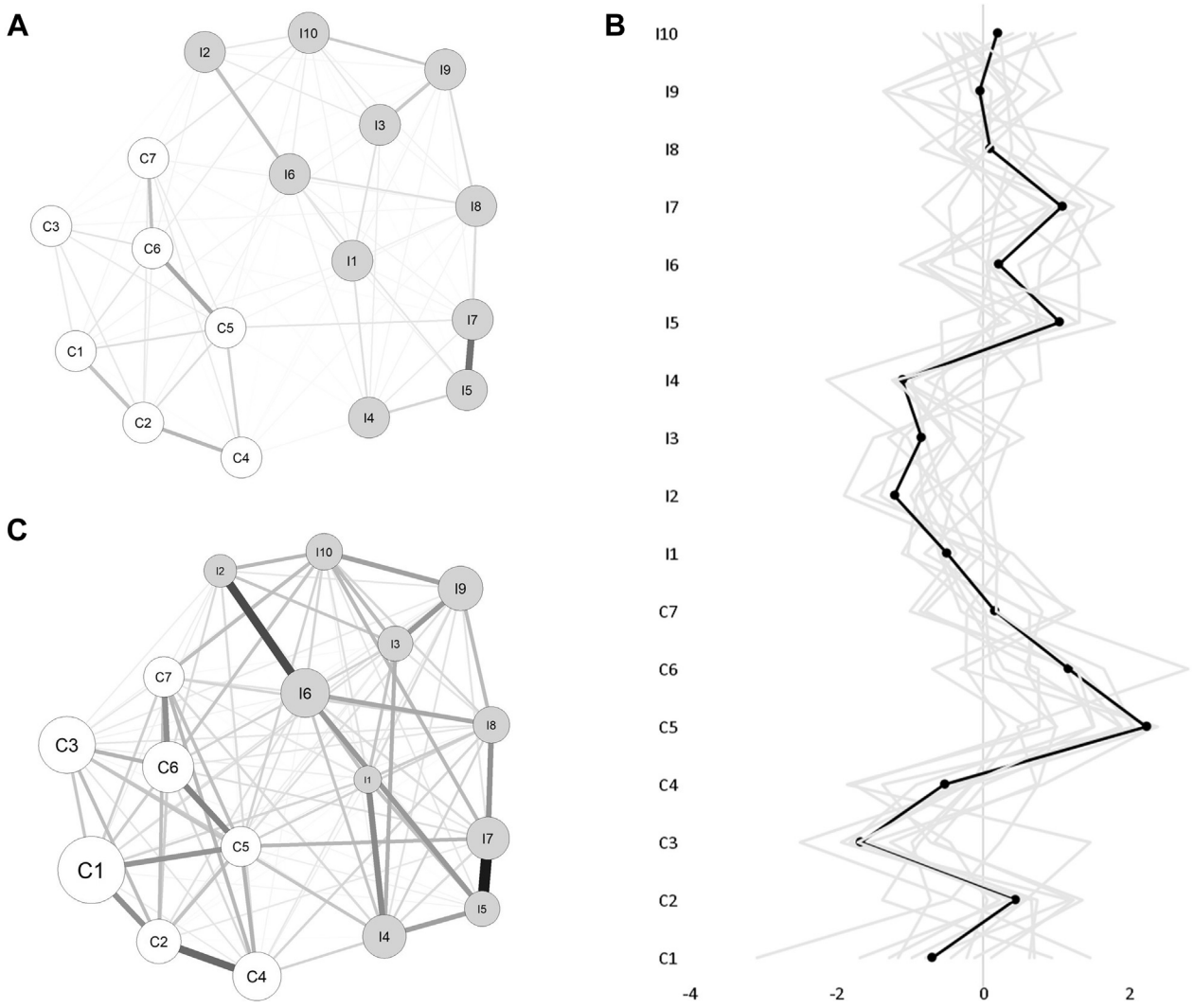

Figure 1. Cross-country analyses. *Note*. (A) Cross-country regularized partial correlation network. White nodes: intra/interpersonal subscale of CYRM-R. Gray nodes: caregiver subscale of CYRM-R. Item wordings in Table 2. Solid edges indicate positive relations, and dashed edges negative relations. The thicker the edge, the larger the edge weight and stronger the unique association between two resources. (B) Expected influence centrality profiles. Black line represents cross-cultural network (black line). Gray lines represent the countries. Higher positive values indicate higher expected influence centrality. (C) Cross-country variability network. Edge thickness indicates the standard deviation of the edge weights across all countries. Node size indicates the standard deviation of the EI centralities across all countries. The thicker the edge/node, the higher its standard deviation and variation across countries.

Stability analyses

Most networks showed a sufficient stability of their EI (above .5). Botswana, India, and Jordan showed acceptable stability above .25. However, Equatorial Guinea showed an insufficient stability of .21.

Discussion

Using data from multiple administrations of the Child and Youth Resilience Measure (CYRM) in 14 countries, this study investigated commonalities and differences in adolescent's resilience networks. No two countries showed the exact same network. This contributes further evidence for the significant influence of the environment on resilience [28]. Most networks were characterized by mostly positively interrelated resources. Some countries showed a high similarity in their resource centrality profiles, whereas others tended to show opposite profiles. In addition, resources were identified that were strongly connected in the resilience network of most countries such as having caregivers or friends that give support during stressful times, although there were also country-specific patterns. Finally, this study showed that the rank order of resources according to their score must not be equal to their rank order according to their connectedness in a network.

Resilience as a network

The following interpretation of the results is mainly based on resource associations and the expected influence centrality of resources. Currently, there is no straightforward interpretation of centrality that is based on cross-sectional data. This makes it

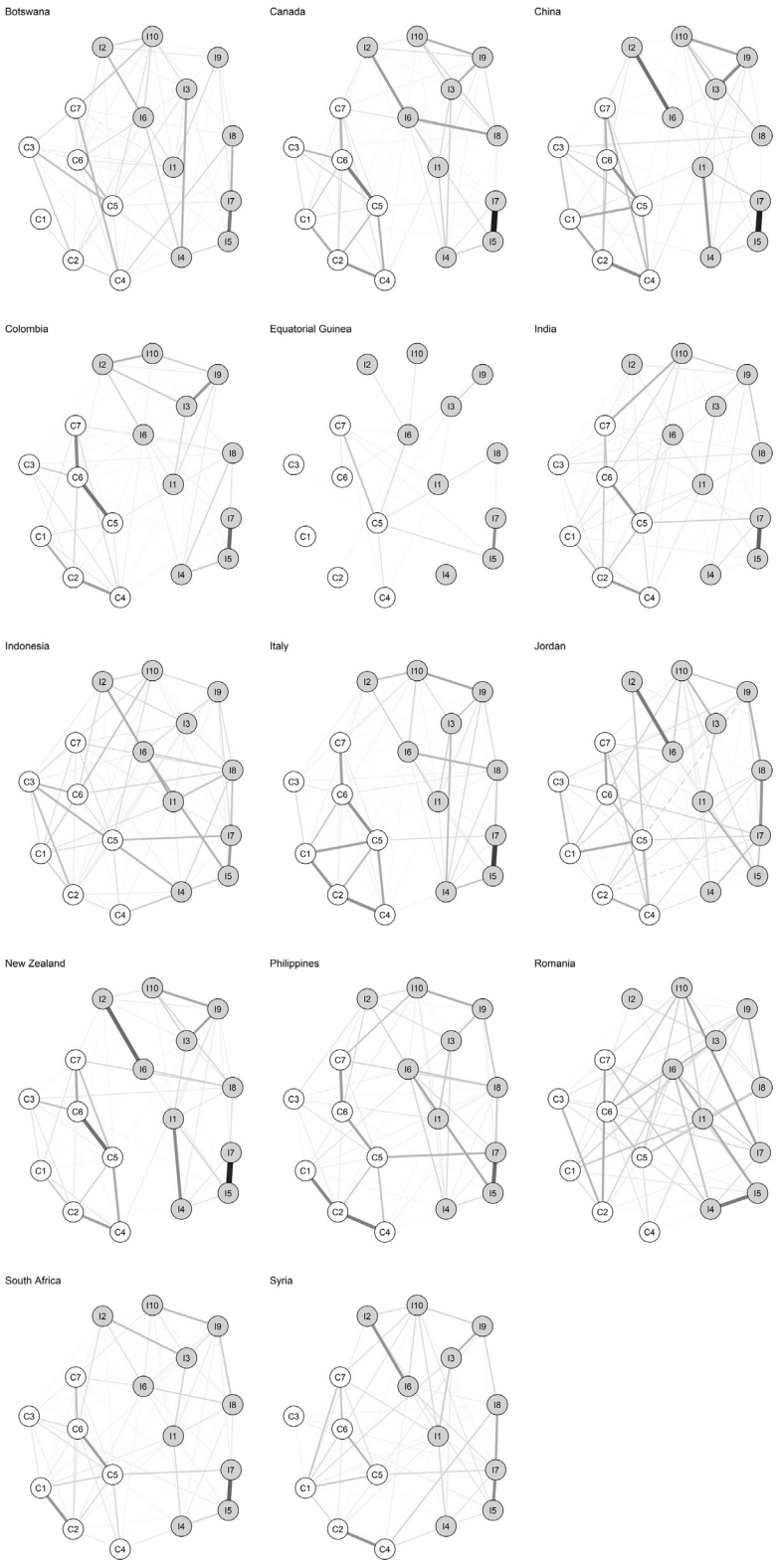

Figure 2. Country-specific regularized partial correlation networks. *Note*. White nodes: intra/interpersonal subscale of CYRM-R. Gray nodes: caregiver subscale of CYRM-R. Item wordings in Table 2. Solid edges indicate positive relations, and dashed edges negative relations. The thicker the edge, the larger the edge weight and stronger the unique association between two resources. See Figure S5 for taller figures.

Table 3
Percentage of significantly different edge weights between countries

	BWA	CAN	CHN	COL	GNQ	IND	IDN	ITA	JOR	NZL	PHL	ROU	ZAF	SYR
BWA		24	15	10	9	8	19	21	11	18	12	7	22	10
CAN			10	13	15	14	29	25	7	7	11	15	32	4
CHN				10	13	13	21	29	4	10	12	9	26	4
COL					11	12	26	30	12	17	19	13	32	13
GNQ						12	28	32	10	26	22	5	32	9
IND							24	31	7	17	23	7	29	12
IDN								24	5	15	7	4	12	7
ITA									5	11	15	10	24	3
JOR										11	15	10	24	3
NZL											15	13	32	5
PHL												8	8	21
ROU													25	6
ZAF														6
SYR														

Numbers indicate how many edges significantly differ between two countries in percent based on moderated network models.
BWA = Botswana; CAN = Canada; CHN = China; COL = Colombia; GNQ = Equatorial Guinea; IND = India; IDN = Indonesia; ITA = Italy; JOR = Jordan; NZL = New Zealand; PHL = The Philippines; ROU = Romania; SYR = Syria; ZAF = South Africa.

necessary to tailor the interpretation of the studied network to the research question and to choose a hypothetical direction of influence [29]. Hence, based on a social–ecological definition of resilience [17], central resources are expected to significantly influence how much other related resources will be available, even if the direction of these network associations has yet to be fully assessed.

The study provides the first multicountry empirical evidence that adolescent resilience can be operationalized as a network of interconnected multisystemic resources. This adds new and important evidence to the literature that stresses that the accessibility of a resource could depend on other resources, from the same and/or different ecological systems. The general positive associations that have been identified between the studied resources of the CYRM indicate that social–ecological resources condition each other: they either facilitate or limit each other. This speaks in favor of the selected resources that are assessed by the CYRM because one does not need to choose between associated resources in the prospect of losing another.

However, the studied CYRM-R captures only a limited number of the social–ecological resources found to be important for an individual's resilience [15]. The average predictability of each country's network shows that resilience relies on more resources. For example, socioeconomic resources such as governmental cash transfers to families living in poverty have been found to exert resilience-enhancing effects on children [30]. Sufficient financial resources could play a crucial role in navigating to other social–ecological resources, such as schools, caregiver time, and nutrition. Such additional resources could, however, also have negative associations with the studied resources because acquaintance with some resources might come at the expense of other resources.

Centrality of resilience resources and resource associations across countries

The study showed that there is a difference between the distribution of resources as indicated by their score on the CYRM and the centrality of resources. The resources with the highest scores were not necessarily found to be the resources with the highest centrality. The same pattern was found for resources with lesser scores and centralities across countries. This indicates that a highly available resource must not be the resource that gives access to relatively many other resources. This finding has important practical implications: interventions should focus on strengthening or sustaining resources that might not be important for the functioning of a resource network but nevertheless be fundamentally important for one's resilience and well-being (e.g., having enough to eat or valuing education showed the highest levels on average but were the least central resources) and focus on strengthening/sustaining central resources to quickly increase the resource portfolio of a person.

Across countries, the *support by caregiver(s) and friends during difficult times* as well as *feeling safe when a child is with its caregiver(s)* were found to be the most central resources. Social support is known to be an important global resource for child and youth resilience [31], whereas the literature on attachment shows the importance of a secure attachment to a caregiver for a child's resilience [32,33]. However, although such former studies have usually shown that robust social support leads to better outcomes in stressful situations [34], the present study shows that social support from caregiver and friends is key for adolescent resilience, likely because it offers access to other resources.

Besides these common central resources, the analysis also showed country-specific centralities. For example, *being treated fairly by one's community* was the resource with the highest centrality in Indonesia. This could indicate that the availability of several resilience resources is strongly influenced by one's community in this country. Furthermore, *the importance of getting an education* was the second most central resource for India and South Africa, which could reflect the usefulness of education for making further resources available in those countries. For example, studies in South Africa have shown that education is culturally valued, more particularly in contexts of structural disadvantage where education is strongly associated with upward life trajectories [35]. These and the other country-specific resource centralities reinforce for the importance of a socio-ecological perspective on resilience [17].

Cross-country and country-specific resource associations were also identified. A strong interdependency between *the feeling of belonging at one's school* and *valuing education* was found for some countries (e.g., Jordan, China, and New Zealand), whereas in other countries, these resources were almost independent of each other (e.g., South Africa, Romania, and

India). This country-specific, nonexistent association might be explained by reports of schools being rather hostile places in more disadvantaged communities [36]. Furthermore, the connection between *feeling supported by one's friends* and the *certainty that friends help in difficult times* showed the strongest variability across countries. Although this connection would be expected to be strong across all countries, for two countries, it was rather low (Jordan) or unconnected (Romania). This could point to the fact that different countries have different reference points for what support and difficult times mean.

Conclusion

This study adds to the literature by contributing a more nuanced understanding of adolescent resilience as a complex network of interacting resources that shows country-specific characteristics. It demonstrates that it is worthwhile endeavor to go behind the usual practice of using total scores of instruments that assess different resources to get a deeper understanding of the processes that constitute resilience. NA is a promising means to further existing understandings of resilience; in combination with longitudinal designs, this tool promises new and significant information for general as well as context-specific resilience interventions.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2020.07.010.

Funding Sources

The position of J.H. was funded by the Swiss National Science Foundation (grant number P2ZHP1_184004).

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