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ASPECTS OF SEXUAL LIFE THAT ARE ASSOCIATED WITH THE OCCURRENCE OF DEPRESSIVE DISORDERS AND AUTONOMIC DYSFUNCTION AMONG MEDICAL STUDENTS OF NATIONAL PIROGOV MEMORIAL MEDICAL UNIVERSITY, VINNYTSYA

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Abstract

Depressive disorders are widespread nowadays. First of all, this was affected by social isolation related to Covid-19, and starting from 2022 – the war in our country. Depression and sexual life are connected and important, because a person with a depressive disorder cannot fully live a social and sexual life. As a result, the birth rate in the country and the population in general decreases. Therefore, the issue of studying the occurrence of depressive disorders in young sexually active and inactive people is extremely relevant.

The aim. The main objective of this work was to explore the different areas of sexual life of residents and its association with mental health. Additionally, differences in sexual life and mental health (depression) based on gender were also analyzed.

Materials and methods. An anonymous survey of 506 medical students of NPMMU, V has been conducted using a questionnaire that included 25 questions on various aspects of the sexual life of the respondents. The analysis of the obtained results of the study was carried out on the basis of the computer programme «Statistica 6.1» using nonparametric methods to evaluate obtained results.

The results. We found a statistically significant association between sexual activity and condition of mental health. Results regarding young adults, presented lower levels of sexual satisfaction and greater depression, whereas young women also exhibited higher levels of depression.

Conclusions. Sexual life has a positive effect on the mental and psychological health of respondents. This information should be conveyed to young people.

Keywords: sexual debut, sexual life, sexual activity, sexual partner, permanent sexual partner, sexual satisfaction, autonomic dysfunction, depressive disorders, autonomic nervous system.

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1. Introduction

An important aspect of the autonomic nervous system is its sensory function [1]. Over 75 % of the fibers in the vagus are afferents. Visceral afferents carry a range of information concerning the internal state of the body, from baroreceptors, chemoreceptors, and other interoceptors of women's and men's genitalia. Some visceral afferents enter the spinal cord and participate information to higher central structures. Although the functional contributions of this ascending visceral information have not been fully elucidated, it has been shown, for example, that baroreceptor activation can reduce cortical arousal, suppress spinal reflexes, and attenuate pain transmission [1, 2]. The impact of this ascending information on rostral neurobehavioral mechanisms, and its role in cognitive and behavioral processes, has become an active area of research. All organs are not dually innervated, however, and it is often the case that actions of the two branches on a given organ are not precisely opposite. These differences can lead to distinct functional states, with differing levels of activity of the two branches, Penile erection and ejaculation, for example, require the coactivation of both autonomic branches [1]. Cerebral cortical areas implicated in the cognitive aspects modulate and regulate ANS activity. It appears that the higher the level of neural organization, the

greater is the integration among these response domains, culminating in the supreme integrative functions of cerebral cortical systems.

The U. S. National Institute of Mental Health Research Domain Criteria (RDoC) propose a much-needed change in approach to the study of mediating factors implicated in mental disorders, shifting away from a categorical, disease-oriented model to a dimensional approach. The RDoC approach essentially proposes a matrix of domains and levels of analyses that relate to different types of psychopathologies and behavioral problems, with the aim of furthering our insights into the nature of psychopathology and its treatment across discrete consensus based diagnoses [3, 4].

Social isolation leads to anhedonia and increases levels of stress-related hormones and peptides in the PVN. Also, social isolation increases behavioral and neuroendocrine responses to an acute social stressor.

Social stressors increase circulating oxytocin, arginine vasopressin, and corticosterone in socially isolated individuals, indicating stressor-induced neuroendocrine activation.

Sexuality is a complex interplay of multiple facets, including anatomical, physiological, psychological, developmental, cultural, and relational factors. An individual's sexuality is varying throughout the life cycle.

Sexuality in adults consists of seven components:

– Gender identity.
– Orientation.
– Intention.
– Desire.
– Arousal.
– Orgasm.
– Emotional satisfaction.

Gender identity, orientation, and intention form sexual identity, whereas desire, arousal, and orgasm are components of sexual function. The interplay of the first six components contributes to the emotional satisfaction of the experience. The expression of a person's sexuality is intimately related to his or her partner's sexuality [4–6].

Symptoms that may indicate on starting depression include: feeling irritable or grumpy, feeling worthless or guilty most of the time, changes in mood and behaviour, losing interest in food or eating too much, having thoughts of death or suicide, feeling tired, lacking motivation and feeling everything is too hard, having trouble sleeping – either falling asleep or staying asleep, lack of interest in their hobbies, social withdrawal, losing weight or gaining weight, not looking after their own hygiene, using cigarettes, bad habits [7–9].

Dopamine and prolactin are two main important biological mediators of sexual desire. This mechanism is poorly understood, but it's known that dopamine increase desire, whereas prolactin – decrease libido. Dopamine directly inhibits prolactin release from the pituitary gland. Medications that change levels of prolactin inhibit dopamine as a result decrease sexual desire along with other sexual side effects [10, 11].

Umulative adverse experiences, including negative life events and early childhood adversity, together with parental depression and/or non-supportive school or familial environments, place young people at risk for developing depression.

– Enhanced life skills and supportive school and family environments can mediate the effect of stressful life events.

– Programs that enhance the school environment are associated with improved behaviour and wellbeing. Umulative adverse experiences, including negative life events and early childhood adversity, together with parental depression and/or non-supportive school or familial environments, place young people at risk for developing depression.

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– Programs that enhance the school environment are associated with improved behaviour and wellbeing.

Kumulative adverse experiences (negative life events, parental depression, nonsupportive familial environments) place young people at risk for developing depression. Teaching interpersonal skills prevent depression in young people.

The «learned helplessness» theory of depression proposes that individuals are susceptible to depression because they have pessimistic attribution to neutral events. This style predict increases in depressed mood in the future life.

Parental depression is a risk factor for depression. Children with a depressed parent are four times more likely to develop depression by age 20 years, and a 60 % chance by age 25 years. A history of parental depression also increases the risk of recurring depression and suicide attempts in adulthood. Maternal depression may affect girls more significantly than boys[12, 13].

Results in terms of gender could be also contradictory due to the characteristics of instruments assessing sexual satisfaction: men are likely to show higher levels of sexual satisfaction than women if the questionnaire is focused on physical aspects, and women are likely to express sexual satisfaction if the instrument has more items related to relational aspects [14].

Gender differences are common theme in the study of mental health. It is well established that gender differences exist in rates of depression and anxiety disorders, with women more likely to experience these disorders than men [15–19]. Women are more likely than men to experience emotional problems and to report a history of non-suicidal self-injury [20]. Men, on the other hand, are more likely to exhibit conduct or behavioral problems, both in adolescence [21] and young adulthood [22]. Accordingly, adolescent women were significantly more likely than men to correctly label depression, yet sex differences were not found in relation to social anxiety [23].

Furthermore, the association of sexual initiation with adolescent's mental health seems to be affected by the type of relationship with the sexual partner. If the relationship is serious and continues for a while after sexual initiation, it can be positive regarding mental health. However, having sex with a partner whose relationship does not involve commitment and/or is of short duration may affect negatively mental health [24].

Studies have shown that sexual initiation increases the prevalence of depressive symptoms in adolescents [25–27].

The risk is higher in females [24–26, 28, 29], as they are usually more influenced by sociocultural norms concerning sexual behavior, and having sex is frequently considered 'inappropriate' for girls but not for boys [30, 31].

In addition, mental changes can be influenced by low self-esteem, which is also more common among females [32–34].

Aim of research was to to identify clinical psychopathological features of somatized depressive disorders and autonomic dysfunction among sexually active students compared with students without a sexual debut of National Pirogov Memorial Medical University, Vinnytsya *(NPMMU, V).*

2. Materials and methods

For the first time on the basis of National Pirogov Memorial Medical University, Vinnytsya in October 2021, the discipline «Fundamentals of Sexology and Sexopathology» was launched as an elective on the basis of the Department of Obstetrics and Gynecology N 1. Within the framework of which the main topics in sexology are considered. At the first lesson, students were asked to complete an anonymous survey, with the help of a questionnaire that included 25 questions on various aspects of the sexual life of the respondents.

A comprehensive clinical and psychological examination was conducted of 506 students of the 4th year of the NPMMU, V from Lower-Middle-Income Countries, such as: Ukraine, Angola, Syria, Egypt, Nigeria, India, Vietnam, Yemen, Uganda, Botswana, Zimbabwe, Zambia, Ghana, Kenya, Namibia, Swaziland, Somalia, Central African Republic, Mongolia, Pakistan, Cameroon, Morocco, Palestine, Kenya, New Guinea, Tunisia, Sudan. We used pathopsychological methods for self-assessment of depression (Patient Health Questionnaire – PHQ-9) (**Table 1**) and the test for detecting signs of autonomic changes (A. Wayne's test) (**Table 2**). The essence of the assessment was that the students independently determined their condition according to a number of signs in a multilevel scale. The questionnaire for identifying signs of vegetative changes (A. Wayne's

test) consisted of 11 questions (**Table 2**). The sum of points less than 15 is the absence of signs of vegetative changes; 16–25 points – moderate autonomic dysfunction, more than 26 points – severe dysfunction [35].

Table 1

Questionnaire Patient Health Questionnaire – PHQ-9

	How often have you been concerned with the following over the last 2 weeks?	Not at all	Several days	More than a half of the time	Nearly every day
1.	Little interest or pleasure in doing things?	0	1	2	3
2.	Feeling down, depressed, or hopeless	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much?	0	1	2	3
4.	Feeling tired or drained?	0	1	2	3
5.	Poor appetite or overeating?	0	1	2	3
6.	Feeling bad about yourself – or that you are a failure or have let yourself or your family down?	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television?	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed? Or so fidgety or restless that you have been moving a lot more than usual?	0	1	2	3
9.	Thoughts that you would be better off dead, or thoughts of hurting yourself in some way?	0	1	2	3
Sum					
total score = ___					

Table 2

A test for identifying signs of vegetative changes (A. Wein, 1998)

Mark your answer as «Yes» or «No»	Yes	No	point
1. Have you ever noticed (when excited etc.) a tendency to:	Yes	No	
a) blush?			3
b) no facial color change?			3
2. Do you ever get numb or cold:	Yes	No	
a) fingers, toes?			3
b) palms completely, feet?			4
3. Do you have a change in color (paleness, redness, cyanosis):	Yes	No	
a) some fingers, toes, feet?			5
b) palms completely, feet?			5
4. Do you notice excessive sweating?	Yes	No	
If yes, underline when «constantly» or «when excited»			4
5. Do you often have a feeling of palpitations, «fading», «cardiac arrest»?	Yes	No	7
6. Do you often experience difficulty breathing: shortness of breath?	Yes	No	
In case of the answer «Yes» specify: «when excited» «in musty place» (underline the necessary word)			7
7. Are you characterized by dysfunction of the gastrointestinal tract: a tendency to constipation, diarrhea, «bloating» of the abdomen, pain?	Yes	No	6
8. If you faint (sudden loss of consciousness or a feeling close to losing it?) If «Yes», specify the conditions: musty room, excitement, prolonged stay in an upright position (underline which)	Yes	No	7
9. Do you have paroxysmal headaches? If «Yes», specify: «diffused» «half of the head» «whole head», compressive or pulsating (underline which)	Yes	No	7
10. Do you currently notice a decrease in efficiency, rapid fatigue?	Yes	No	5
11. Have you noticed sleep disorders?	Yes	No	
If the answer is «Yes», specify: a) difficulty falling asleep; b) superficial, shallow sleep with frequent awakenings; c) a feeling of insomnia, fatigue when waking up in the morning			5

The Depressive Disorders Identification Scale (PHQ-9) is a 9-question questionnaire that reflects the level of depression. 9 items were scored for depression; for each item, the person was asked to rate the emotion severity level experienced over the past several weeks. Responses were recorded on a 4-point scale ranging from 0 (i.e., «Not at all») to 3 (i.e., «Extremely»). A total score was obtained for scale by adding up the individual scores. The results were evaluated as follows: indicators from 1 to 9 points were considered as minimal depressive disorders (dysthymia), 10–14 points indicated mild depressive disorders; 15–19 points – depressive disorders of moderate severity; 20 and more – severe depression. Statistical processing of the obtained results of the study was carried out on the basis of the computer program Statistica 6.1 (StatSoftInc., USA) using non-parametric methods for evaluating the results obtained [36–40].

Bioetics

We have obtained all appropriate patient consent forms. In the form the resident(s) has/have given his/her/their consent for his/her/their clinical information to be reported in the journal. The participation in the study was completely voluntary and anonymity would be guaranteed.

The bioethics commission: «Anonymous voluntary survey of students on sexuality education», – protocol No. 1 September 10, 2021.

Statistical Analysis

The data obtained as part of the research were analyzed using the «Statistica 6.1» programme using nonparametric methods. Descriptive statistical methods such as numerical, percentage, mean and standard deviation were used to assess the data. To analyze the factors correlated with sexual life and mental health scores, t-tests and linear regression were performed.

3. Results

The final sample used for analysis was comprised of 564 young people: 233 (41.31 %) were men and 331 (58.69 %) were women; all between 20 and 25 years old ($M = 21.65$; $SD = 2.71$); 393 (69.68 %) participants were sexually active, 171 (30.32 %) – sexually inactive. Participants were recruited from university 4th course. They were given the questionnaire once they signed the consent form. A total of 8 students rejected participation (1.42 % of the original sample, $n = 564$); 4 questionnaires presented incomplete answers (0.7 %); and 28 identified themselves as non-heterosexual (4.96 %) 18 not identified (3.2 %). None of these participants was part of the final sample. A cross-sectional (one moment application study) was used to examine the relationship between sexual satisfaction and the mental health of young adults (levels of depression). So general final sample consists from 506 respondents.

In all cases, the study was implemented with paper-pencil questionnaires. All participants agreed to collaborate voluntarily, without material incentive. This study was carried out with the approval of the Bioethics Committee of the University (ethical code) and all subjects gave written informed consent.

Participants were informed that their answers were anonymous and confidential and that they could refuse to participate or withdraw from the study at any time. About 25 minutes were needed to complete the questionnaire. Only those questionnaires that were fully completed were analyzed ($n = 506$).

The prevalence of depressive disorders is significantly greater in sexually inactive medical students compared with sexually active $p > 0.01$ (**Table 3**).

In general, the interaction between presence of permanent partner and gender was significant $p > 0.01$ for depression and much more spread among young women.

Higher number of sexual partners has a significant statistical impact on the development of depressive disorders in sexually active young adults $p > 0.01$ ($t = 3.4$).

A statistically significant difference is established between presence of a permanent sexual partner and depressive disorders in young people $p > 0.05$ ($t = 5.2$). Young men without a current partner exhibited higher levels of depression than young men in a current relationship, whereas no differences were found in young women.

Table 3

Prevalence of depressive disorders among medical students of National Pirogov Memorial Medical University, Vinnytsya ($n = 506$)

DEPRESSIVE DISORDERS	Sexually active $n = 363$ ($P \pm m$ %)		Value p	Sexually inactive $n = 143$ ($P \pm m$ %)		Value p
	Male $n = 156$ ($P \pm m$ %)	Female $n = 207$ ($P \pm m$ %)		Male $n = 47$ ($P \pm m$ %)	Female $n = 96$ ($P \pm m$ %)	
Minimal	85 (23.4 ± 7.31 %)	63 (17.35 ± 6.54 %)	$p > 0.01$	29 (20.27 ± 11.07 %)	46 (32.16 ± 12.85 %)	$p > 0.01$
Mild	43(11.85 ± 5.58 %)	74 (20.38 ± 6.95 %)	$p > 0.01$	9 (6.3 ± 6.68 %)	18 (12.59 ± 9.13 %)	$p > 0.01$
Moderate	9 (2.45 ± 2.67 %)	43 (11.85 ± 5.58 %)	$p > 0.01$	2 (1.4 ± 3.23 %)	15 (10.48 ± 8.43 %)	$p > 0.01$
Severe	7 (1.93 ± 2.37 %)	22 (6.06 ± 4.12 %)	$p > 0.01$	2 (1.4 ± 3.23 %)	10 (7 ± 7.02 %)	$p > 0.01$
Absence	12 (3.35 ± 3.08 %)	5 (1.38 ± 2.01 %)	$p > 0.01$	5 (3.5 ± 5.06 %)	7 (4.9 ± 5.94 %)	$p > 0.01$

Note: $p < 0.01$ SE: Standard error

As for contraception:

– It was established statistically significant $p > 0.01$ ($t = 4.3$) that usage of contraception reduce the risk of depressive disorders.

We found statistically significant higher values $p > 0.01$ ($t = 4.3$) between frequency of usage of the emergency contraception and occurrence of depressive disorders among young women.

There is statistically significant higher values between the beginning of sexual life and using of contraception $p > 0.01$ ($t = 3.9$).

As for sexual initiation among young people:

– statistically significant difference is established between early sexual debut and depressive disorders in sexually active young adults $p > 0.01$ ($t = 2.4$);

– also statistically significant difference is present between early age of sexual debut and greater number of sexual partners $p > 0.01$ ($t = 7.7$);

– statistically significant difference is present between early sexual debut and dissatisfaction from sex $p > 0.01$ ($t = 8.1$);

– statistically significant higher values are between early sexual debut and experience of anal sex $p > 0.01$ ($t = 5.2$) and oral sex $p > 0.01$ ($t = 4.9$);

– the interaction between early sexual debut and occurrence of vegetative changes is statistically significant $p > 0.01$ ($t = 9.6$);

There are no significant or tendency differences $p > 0.01$ between occurrence of autonomic dysfunction among sexual active (41.6 % ± 6.66 %) and sexual inactive medical students (45.45 % ± 10.72 %) (**Table 4**).

Table 4

Prevalence of autonomic dysfunction among medical students of National Pirogov Memorial Medical University, Vinnytsya ($n = 506$)

AUTONOMIC DYSFUNCTION	Sexually active $n = 363$ ($P \pm m$ %)		Value p	Sexually inactive $n = 143$ ($P \pm m$ %)		Value p
	Male $n = 156$ ($P \pm m$ %)	Female $n = 207$ ($P \pm m$ %)		Male $n = 47$ ($P \pm m$ %)	Female $n = 96$ ($P \pm m$ %)	
No manifestations	94 (25.9 ± 4.50 %)	57 (15.70 ± 3.74 %)	$p > 0.01$	31 (21.67 ± 6.75 %)	35 (24.48 ± 7.05 %)	$p > 0.01$
Minimal manifestations	37 (10.19 ± 3.11 %)	38 (10.47 ± 3.15 %)	$p > 0.01$	11 (7.69 ± 4.37 %)	21 (14.69 ± 5.80 %)	$p > 0.01$
Maximum manifestations	25 (6.89 ± 2.60 %)	112 (30.85 ± 4.75 %)	$p > 0.01$	5 (3.49 ± 3.01 %)	40 (27.98 ± 7.36 %)	$p > 0.01$

Note: $p < 0.01$ SE: Standard error

The value of autonomic dysfunction is statistically significant $p > 0.01$ ($t = 2.3$) increases with an increase in the number of sexual partners and decrease with a presence of a permanent one $p > 0.01$ ($t = 2.0$).

There are no significant or tendency differences between occurrence of autonomic dysfunction and usage of emergency contraception $p > 0.01$ ($t = 1.8$). The same for occurrence of

autonomic dysfunction and depressive disorders among sexually active ($t = 0.88$) and among sexually inactive ($t = 0.99$) young adults $p > 0.01$.

We found a statistically significant difference $p > 0.01$ in the manifestations of autonomic dysfunction among sexually active young men and women ($t = 2.86$) and among sexually inactive young men and women ($t = 5.03$).

At the same time, there wern't statistically difference $p > 0.01$ in the manifestations of depressive disorders among sexually active young men and women ($t = 0.08$) and among sexually inactive young men and women ($t = 0.33$).

4. Discussion

In the present study, we explored how the different areas of sexual life of residents associate with mental health. We hope that this will be of significance to create the programs that will be conducted at schols and institutes in Ukraine, in relation to sexual educational and enlightener practice. There are no any sexual awareness programs at all in our country. We understand that anonymity is both an advantage and a disadvantage of our research results. But using this anonymous survey method we can get more honest answers among young people. Issues of sexual education are not acceptable for all students, that is why the guarantee of anonymity is a guarantee of openness.

After conducting a retrospective analysis of the literature, no data were found that show the dependence of autonomic dysfunction of young men and young women and their sexual life. Therefore, our data is innovative in this field. our research show how important is to study different manifestations of the autonomic dysfunction in.

We established that early sexual debut provokes the occurence of vegetative changes in the body $p > 0.01$ ($t = 9.6$). Therefore, enlightenment information should be provided in adolescence in order to prevent severe manifestations of autonomic dysfunction. The earlier the adolescent receives the correct knowledge about sexual life – the better sexual functioning will be present in the future for him.

Concerning depressive disordersб many studies have been conducted on this matter.

With respect to mental health, although extensive research has been conducted on anxiety and depression among adults, little is known about profiles of depression and anxiety throughout the life cycle. In addition, the role that having a romantic partner plays in mental health may vary depending on the life stage. Most of the studies on young adults population shows that those in romantic relationships tend to exhibit better mental health than those who are single [12, 13]. Our research also confirms this information – presence of a permanent partner decreases risk not only of depressive disorders but also manifestations of autonomic dysfunction $p > 0.01$.

Among young people, that association became weaker or nonexistent for both genders and different relationship statuses, maybe because at this developmental stage sexual behavior is more normative as they got older. However, in a study with college students from the USA, involvement in a romantic relationship, compared to being single, was found to be associated with fewer depressive symptoms, yet only for women [41]. It is reasonable to think that sexual satisfaction may be more important for the mental health and well-being of those in a current relationship and those whose gender role suffers more sociocultural pressures, as has been found in the case of women, although current evidence suggests otherwise [42].

In our study was established that presence of a permanent sexual partner for more than 6 months reduces the risk of depressive disorders. Frequent change of sexual partners leads to severe manifestations of depression disorders $p > 0.01$.

An exception is the work carried out in the USA by Vasilenko [43], which used a general sample of adolescents and young adults. In this study, sexual behavior of adolescents was found to be associated with symptoms of depression, especially among girls. In addition, sex with a non-relationship partner was associated with an increase in depressive symptoms for adolescent girls, but not for adolescent boys. As the author of this research explains, girls are more likely to be influenced by socio-cultural norms regarding sexual behaviour, with sexual intercourse being widely regarded as «inappropriate» for girls but not for boys [44].

According to the study the earlier sexual initiation occurs, the higher the percentage of depressive disorders among young people. But young people without sexual debut also suffer from the manifestations of depressive disorders, especially young girls $p > 0.01$.

Study limitations. The findings of this study have to be seen in light of some limitations.

The first limitation is the lack of prior research studies on the anxiety and depressive disorders among sexual active and virgin medical students in our country.

The second limitation is that the sample size has been relatively small, which potentially hindering the generalisability of findings.

The third limitation concerns the heterogeneity of the study populations, according their religion views. We did not take into account the religious views of the students

Prospects for further development. Continued efforts are warranted to conduct research and scientific reporting on the optimal assessment of sexual disorders, including multidisciplinary approaches. We try to provide accessible and correct medical information for young people, not distorted by the Internet.

Conclusions

1. Interaction between presence of permanent partner and gender was significant for depression and much more spread among young women ($p > 0.01$).

2. A significant percent of young women which use contraception have less risk of depressive disorders. Although, young women which use emergency contraception have very high risk of depressions.

3. Young men without a current partner exhibited higher levels of depression, than young men in a current relationship.

4. No differences were found in young women with or without a current partner and occurrence of depressive disorders or autonomic dysfunction.

5. Early sexual debut courses depressive disorders in sexually active young adults.

6. Early sexual debut provides experience of anal and oral sex among young adults ($p > 0.01$).

7. All students used for analysis would you like to have a course of sexual education at university, fccording our research.

In conclusion, this research is significant for several reasons. This study draws attention to the impotance of sexual satisfaction among young adults. Sex education is the only way to prepare young people for making healthy decisions.

Conflict of interest

We have no any conflict of interest in relation to this paper, as well as the published research results, including the financial aspects of conducting the research, obtaining and using its results, as well as any non-financial personal relationships.

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