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A Multidimensional Approach to Assessing Infectious Disease Risk: Identifying Risk Classes Based on Psychological Characteristics

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Prevention of infectious diseases depends on health-related behavior, which is often influenced by psychological characteristics. However, few studies assessing health-related behavior have examined psychological characteristics to identify risk groups, and this multidimensional approach might improve disease risk assessment. We aimed to characterize subgroups based on psychological characteristics and examine their influence on behavior and disease risk, using chlamydia as a case study. Selected participants (heterosexuals aged 18–24 years and females aged 18–24 years who had sex with both men and women) in a Dutch longitudinal cohort study (the Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission (iMPaCT) Study) filled out a questionnaire and were tested for chlamydia (2016–2017). Latent class analysis was performed to identify risk classes using psychological predictors of chlamydia diagnosis. Two classes were identified: class 1 (n = 488; 9% chlamydia diagnosis) and class 2 (n = 325; 13% chlamydia diagnosis). The proportion of participants with high shame, high impulsiveness, and lower perceived importance of health was higher in class 2 than in class 1. Furthermore, persons in class 2 were more likely to be male and to report condomless sex compared with class 1, but the number of recent partners was comparable. Thus, risk classes might be distinguished from each other by psychological characteristics beyond sexual behavior. Therefore, the impact of the same intervention could differ, and tailoring interventions based on psychological characteristics might be necessary to reduce chlamydia prevalence most effectively.

Chlamydia trachomatis; health behavior; infectious diseases; latent class analysis; psychological factors; risk behavior; risk factors

Abbreviations: iMPaCT, Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission; LCA, latent class analysis; STI, sexually transmitted infection.

Infectious diseases are a major cause of morbidity and mortality worldwide (1). Prevention and control of infectious diseases depends on individuals' health-related behavior (2, 3), which in turn is influenced by many factors, including psychological characteristics, such as intentions, attitudes, and risk perception (4). The sexually transmitted infection (STI) *Chlamydia trachomatis* (chlamydia) can be used to illustrate the interplay between behavior and psychology in the transmission of infectious diseases. Chlamydia is the most commonly diagnosed bacterial STI among young heterosexuals in many Western countries, and its prevalence in the general population has remained unchanged over the past several years, even in countries with chlamydia screening programs (5–7). Because most chlamydia infections are asymptomatic (8), psychological characteristics, such as low perceived importance of health or low perceived risk for chlamydia, could have a negative effect on health-related behavior, namely preventive (i.e., condom use) or health-care-seeking (i.e., chlamydia testing uptake) behavior, and therefore on chlamydia control efforts (9–12).

Sexual behavior, in terms of the number of partners, plays an important role in chlamydia transmission (13, 14). However, having many partners is not necessarily risky when people view themselves as being at risk for acquiring chlamydia and use condoms consistently. Therefore, a single

behavioral factor might not be sufficient to characterize the risk of chlamydia (15, 16). The importance of a multidimensional approach to characterize chlamydia risk has been underlined by previous research (16–20). These studies identified risk classes based on multiple behavioral risk factors for STIs or human immunodeficiency virus infection, resulting in subgroups of persons with risky behavior. Most of these studies, however, did not examine psychological characteristics (16–19) or were not able to link risk classes to laboratory-confirmed chlamydia diagnoses (hereinafter referred to as "chlamydia diagnoses") (20). Psychological and behavioral variables are related to each other; however, the direction of this link is not self-evident. For example, in impulsive individuals, salient information could steer behavior towards more or less risk, depending on the evaluative value of the information (21, 22). Thus, consideration of underlying psychological mechanisms of behavior that could be targeted in individual-oriented interventions to reduce risk behavior might improve the risk characterization and prevention of chlamydia.

To explore the link between multiple psychological and behavioral characteristics and relate them to chlamydia diagnoses, a longitudinal cohort study entitled iMPaCT (Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission) was initiated among persons being tested for chlamydia at STI clinics in the Netherlands (23). In the current study, we aimed to characterize risk classes based on psychological predictors of chlamydia diagnosis identified in the iMPaCT data. We explored how these risk classes differed with respect to demographic factors, psychological characteristics, sexual behavior, and sexual health, such as chlamydia diagnosis.

METHODS

Setting

The protocol of the iMPaCT Study has been described in detail elsewhere (23). Briefly, selected individuals (heterosexuals aged 18–24 years and females aged 18–24 years who had sex with both men and women) who made an appointment at the STI clinic of Amsterdam, Kennemerland, Hollands Noorden, or Twente in the Netherlands between November 2016 and June 2017 were eligible to participate. People were invited to participate after the online intake assessment for an STI test, if they met the inclusion criteria based on sexual behavior in the past 6 months, as indicated during triage. Since it was not possible to make an appointment online at the STI clinic in Twente, people were invited to participate while making an appointment by telephone. Persons who agreed to participate provided informed consent and were followed for 1 year. Participants were asked to complete an online baseline questionnaire before their STI clinic visit, because the STI clinic consultation might have influenced reporting of psychological and behavioral characteristics (24).

This study was approved by the Medical Ethical Committee of the University Medical Centre Utrecht, Utrecht, the Netherlands.

Data collection

In this study, demographic, sexual health-related, behavioral, and psychological data collected at baseline were used. Behavioral and psychological data were collected in the online questionnaire. This questionnaire was based on several validated questionnaires, which has been described elsewhere (23). Sexual behavior questions included number of sexual partners (lifetime/past 6 months/past 4 weeks) and age at first sexual activity.

The following psychological characteristics were included in the questionnaire: risk perception, intentions regarding condom use and STI testing, attitudes regarding prevention of chlamydia, perceived importance of health (hereinafter called "health goals"), knowledge regarding sexual health, prevention of chlamydia and consequences of chlamydia, stigma, anticipated shame with regard to a chlamydia diagnosis, self-efficacy with regard to condom use, expected social support after a chlamydia diagnosis, subjective and social norms regarding condom use and STI testing, self-esteem, and impulsiveness. All psychological variables were measured using multiple-item scales (series of questions or prompts), and each multiple-item scale represented 1 psychological variable, with the exception of impulsiveness. Impulsiveness is a multifaceted concept and was therefore divided into 4 subscales: negative urgency (tendency to engage in impulsive behavior in reaction to negative emotions), lack of perseverance (experiencing difficulty with continued efforts), lack of premeditation (tendency to engage in impulsive behavior without contemplation), and sensation-seeking (tendency to pursue novel, exciting, and intense sensations and experiences) (25). Each item in the multiple-item scales was measured on a 5-point Likert scale, with the exception of the variables risk perception and knowledge. Risk perception was assessed by asking participants to estimate their own risk of acquiring chlamydia and the risk for their peers (in the coming year/in a lifetime), on scales ranging from 0 to 100. Knowledge regarding sexual health, prevention of chlamydia, and consequences of chlamydia was measured by means of 6 true/false items.

Demographic and sexual health information as registered by the STI clinics in the electronic patient dossier, such as chlamydia test results from the current visit at baseline and from previous visits (nucleic acid amplification tests), was obtained from national STI surveillance data. An iMPaCT Study number was assigned to each participant, which was linked to their identification number in the national STI surveillance database. Demographic information collected included age, sex (female/male), educational level (low/medium (no education, primary education only, lower general secondary education, or vocational education) or high (all other levels of education)) migration background (ethnic Dutch/non-Dutch migration background (26)), and sexual health-related information. Sexual health-related information included STI test results at the current visit (positive at any anatomical location/negative), type of STI test at baseline visit (regular consultation/self-test kit), prior chlamydia/gonorrhea/syphilis diagnosis in the past year (yes/no), relationship status with the most recent partner (steady/casual), number of partners in the past 6 months, having had an STI test in the past year,

STI-related symptoms, having received a partner notification, having a partner in a risk group (having a partner who was a first-generation migrant from an STI-endemic region or being the female partner of a man who had sex with men), and condom use with the most recent partner (all yes/no).

Statistical analyses

All participants who completed the baseline questionnaire before the STI clinic visit were included in the statistical analyses. The proportion chlamydia-positive is usually higher among persons who are notified by their partner than in persons who are not notified (27), and the decision to visit the STI clinic among persons who have been notified by infected partners is more likely to be based on external reasons and not on psychological characteristics, such as risk perception. Since this might distort the association between psychological characteristics and chlamydia diagnosis, participants who received partner notifications were excluded.

A mean score for each psychological variable was calculated by dividing the total score of all the items in the multiple-item scale by the number of items in that scale. Scores ranged from 1 (i.e., low level of the determinant) to 5 (i.e., high level of the determinant). Perception of one's own risk of chlamydia infection and of peers' risk were both defined as the mean of 2 estimates (in the coming year/in a lifetime). Knowledge regarding sexual health, prevention of chlamydia, and consequences of chlamydia was included as the sum score of 6 items, based on the number of correct answers (0–6).

Predictors of chlamydia diagnosis (nucleic acid amplification test results at the current visit) were identified using univariable and multivariable logistic regression analyses ($P < 0.1$). All behavioral and psychological variables, obtained from the online questionnaire, and demographic and sexual health-related variables, obtained from the national STI surveillance database, were included in the univariable and multivariable analyses. To define cutoff values that are easily applicable in daily clinical practice, we divided data on continuous behavioral and psychological variables (if normally distributed) into 2 categories at the median value. The multivariable model was constructed with a backward elimination procedure, using the Akaike Information Criterion score. Missing values were included as a separate category if more than 5% of the observations were missing.

Latent class analysis (LCA) was performed to characterize distinct risk classes that could be targeted with behavioral interventions. The univariable analysis of predictors of chlamydia diagnosis was used as a preselection method to identify the psychological variables to be included in the LCA. In the LCA, underlying dimensions (latent classes) of the dependent variables were inferred on the basis of patterns in the observed data. The number of latent classes was determined by a combination of fit indices, including the Akaike Information Criterion score and the Bayesian Information Criterion value (lower values indicating a better fit), entropy (>0.8 indicating good classification), the degrees of freedom (negative degrees of freedom indicating a lower number of latent classes needed), and interpretability of the classes (17). The uncertainty of the results was tested by comparing the LCA including the identified psychological predictors of chlamydia diagnosis to 1) an LCA with behavioral and psychological predictors of chlamydia diagnosis, 2) an LCA including behavioral variables that were not identified as predictors of chlamydia diagnosis, and 3) an LCA including psychological and behavioral variables selected using a swap-stepwise (backward) preselection method (28, 29).

Demographic, behavioral, and sexual health-related variables, obtained from the national STI surveillance database and the online questionnaire, were compared between the latent classes. If the entropy value of the LCA was 0.80 or more, participants were hard-classified to their most likely latent class membership (30) and compared with univariable and multivariable logistic regression analysis. Again, the multivariable model was constructed with a backward elimination procedure, using the Akaike Information Criterion score, and missing values were included as a separate category if more than 5% of the observations were missing. If the entropy value of the LCA was less than 0.8, comparisons were done using a weighted multiple-group analysis (31). The proportions of chlamydia-positive persons were compared between the risk classes using a χ^2 test. All statistical analyses were conducted using R, version 3.4.0 (R Foundation for Statistical Computing, Vienna, Austria) (32).

RESULTS

Study population

In total, 933 heterosexual men and women and females who had sex with both men and women completed the baseline questionnaire (response rate = 7%). Participants who completed the questionnaire after their STI clinic visit were excluded ($n = 14$). Furthermore, 106 participants were excluded because they were notified by their partner. Of the 813 remaining participants included in the analyses, the majority were female (81%), highly educated (89%), and ethnic Dutch (81%), and the median age was 22 years (interquartile range, 21–23). Chlamydia was diagnosed in 84 participants (10%).

Latent class analysis

The psychological variables health goals, anticipated shame, and impulsiveness (negative urgency) were predictors of chlamydia diagnosis in the univariable analyses (Table 1; also see Web Table 1, available at https://academic.oup.com/aje). In the multivariable analysis, participants were more likely to be diagnosed with chlamydia if they had a low/medium level of education, were ethnic Dutch, and reported having had 2 or more sexual partners in the past 4 weeks (Table 1). In addition, persons with high anticipated shame were less likely to be infected with chlamydia than persons with low/medium anticipated shame.

The psychological predictors of chlamydia diagnosis identified in the univariable logistic regression analysis, including health goals, anticipated shame, and impulsiveness (negative urgency), were examined in the LCA. After assessing the model fit of 1–6 classes to the observed data, we selected the model with 2 classes based on a combination of the lowest Bayesian Information Criterion, the highest entropy value,

Table 1. Determinants of Receiving a Chlamydia Diagnosis (Univariable and Multivariable Logistic Regression Analysis) Among Participants in the iMPaCT Study, the Netherlands, 2016–2017

Determinant	CT− (n = 729)		CT+ (n = 84)		Crude		Adjusted[a]	
	No. of Persons	%	No. of Persons	%	OR	95% CI	OR	95% CI
Age, years								
18–21	282	38.7	37	44.1	1.00	Referent		
22–24	447	61.3	47	56.0	0.80	0.51, 1.27		
Sex								
Female	600	82.3	71	84.5	1.00	Referent		
Male	129	17.7	13	15.5	0.85	0.44, 1.54		
Educational level[b]								
Low/medium	69	9.5	18	21.4	1.00	Referent	1.00	Referent
High	660	90.5	66	78.6	0.38[c]	0.22, 0.70	0.35[c]	0.20, 0.66
Migration background								
Ethnic Dutch	579	79.4	78	92.9	1.00	Referent	1.00	Referent
Non-Dutch	150	20.6	6	7.1	0.30[c]	0.11, 0.64	0.28[c]	0.10, 0.60
No. of sexual partners in past 4 weeks[d]								
0–1	494	67.8	43	51.2	1.00	Referent	1.00	Referent
≥2	235	32.2	41	48.8	2.00[c]	1.27, 3.16	2.03[c]	1.27, 3.23
Health goals[d]								
Low/medium (score <4.00)	329	45.1	48	57.1	1.00	Referent		
High (score ≥4.00)	400	54.9	36	42.9	0.62[c]	0.39, 0.97		
Anticipated shame[d]								
Low/medium (score <3.75)	284	39.0	41	48.8	1.00	Referent	1.00	Referent
High (score ≥3.75)	445	61.0	43	51.2	0.67[e]	0.43, 1.05	0.61[c]	0.38, 0.98
Impulsiveness (NU)[d]								
Low/medium (score <2.50)	318	43.6	28	33.3	1.00	Referent	1.00	Referent
High (score ≥2.50)	411	56.4	56	66.7	1.55[e]	0.97, 2.52	1.62[e]	0.99, 2.69

Abbreviations: CI, confidence interval; CT+, *Chlamydia trachomatis*–positive; CT−, *Chlamydia trachomatis*–negative; iMPaCT, Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission; NU, negative urgency; OR, odds ratio.

[a] Adjusted for all other variables shown in the table.

[b] Educational level was defined as low/medium (no education, primary education only, lower general secondary education, or vocational education) or high (all other levels of education).

[c] $P < 0.05$.

[d] Behavioral and psychological variables were divided into 2 categories using a median split.

[e] $P < 0.1$.

and interpretability (Table 2). The item-response probabilities (the probability of a response to each item in a scale) by outcome variable for each latent class were used to characterize the psychological characteristics of the latent classes (Table 3). Based on the most likely membership classes estimated for each individual in the LCA, 60% of the study population was assigned to class 1 ($n = 488$) and 40% to class 2 ($n = 325$). A larger proportion of participants in class 2 were characterized by low/medium health goals, high anticipated shame, and high impulsiveness as compared with class 1.

The proportion of chlamydia-positive participants was higher ($P = 0.1$) in class 2 ($n = 41$; 13%) than in class 1 ($n = 43$; 9%). In the multivariable model, persons in class 2 were more likely to be male and less likely to report having used a condom with their most recent partner than persons in class 1 (Table 4). Numbers of partners in the past 4 weeks were comparable in classes 1 and 2.

The uncertainty analyses (i.e., adding number of partners in the past 4 weeks, adding condom use with the most recent partner, replacing number of partners in the past 4 weeks with number of partners in the past 6 months, and using a preselection method) yielded results similar to those of the LCA with the identified predictors of chlamydia diagnosis. A 2-class model was still the best-fitting model (Web Tables 2–5). Furthermore, the item-response probabilities for the psychological predictors in the two classes were exactly the same as the LCA with the chlamydia predictors (Web Tables 6–8) or were more difficult to interpret (Web Table 9).

Table 2. Fit Statistics for Latent Class Analysis With 1–6 Classes, Including Health Goals, Anticipated Shame, and Impulsiveness (Negative Urgency), Among Participants in the iMPaCT Study, the Netherlands, 2016–2017

No. of Classes	AIC	BIC	Entropy Value
1	3,332	3,346	N/A
2	3,307	3,340	0.99
3[a]	3,300	3,352	0.52
4[a]	3,309	3,379	0.33
5[a]	3,317	3,406	0.26
6[a]	3,325	3,433	0.27

Abbreviations: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; iMPaCT, Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission; N/A, not applicable.

[a] Negative degrees of freedom (model not identifiable).

DISCUSSION

This study demonstrated that multiple psychological characteristics should be taken into account in the assessment of chlamydia risk. Two distinct risk classes were identified based on psychological predictors of chlamydia diagnosis. High impulsiveness, high anticipated shame, and low/medium health goals were observed more often in the risk class with less condom use and a higher proportion of chlamydia-positive persons but comparable numbers of partners in the past 4 weeks. Thus, risk classes might be differentiated from each other by psychological characteristics that go beyond sexual behavior, and this could influence the impact of interventions in each risk class on sexual behavior and the transmission of chlamydia.

The main strength of this study was the comprehensive collection of data on multiple demographic, behavioral, and psychological risk factors in a relatively large study population, which to our knowledge has not been combined in a study to this extent before. We were able to combine these risk factors and identify 2 risk groups for chlamydia diagnosis that are easily interpretable. Furthermore, because all behavioral and psychological determinants were measured right before the participants visited the STI clinic, the study design allowed us to exclude the possibility that STI test results or information obtained during the consultation influenced behavioral and psychological determinants.

There were also a few limitations of this study. STI clinic visitors tend to be more high-risk than the general population, which means that the predictors of chlamydia diagnosis identified in this study might not be generalizable to the general population (27, 33). However, the study population was rather homogeneous in terms of number of partners, which allowed for uncovering underlying psychological indicators of behavior that could be targeted in interventions to reduce risk behavior. Another limitation is that behavioral and psychological variables were self-reported, which could have led to reporting bias or recall bias. In order to minimize this bias, we used several strategies, such as using specified recall periods (e.g., the past 4 weeks) and implementing error warnings in the online questionnaire (e.g., the number of partners in the past 4 weeks could not be higher than the number of partners in the past 6 months) (34). Furthermore, dichotomizing a variable into low and high categories might lead to loss of information (35). However, binary variables are more easily applicable in daily clinical practice than a continuous measure, as it defines a clear threshold at which point one might need to take action (36), and it improved the interpretability of the latent classes. Finally, psychological variables that were not predictors of chlamydia diagnosis were not considered in the LCA as latent variables or covariates, which may have produced biased results. However, the uncertainty analysis showed that including more variables worsened the classification performance and hampered the interpretability of the latent classes.

Our results showed that although psychological characteristics can be different between latent classes, the number of partners might be similar. This finding is in line with those of Thorsen (20), who found that adolescents in different latent classes engaged in similar sexual behavior but varied in terms of psychological characteristics. This study supports evidence from previous studies on the (indirect) association of impulsiveness with risky sexual behavior, such as non–condom use, and higher chlamydia risk (37, 38). Furthermore, in our study, high anticipated shame was associated with lower risk of chlamydia diagnosis; this is in accordance with findings of Sales et al. (39), which showed that, although STI diagnosis was not examined as an outcome, a higher level of STI-related shame was a predictor of preventive behavior, such as condom use, which would decrease STI risk. In contrast, the results of our LCA showed that the proportion of persons with high anticipated shame was slightly higher among people in class 2, who were less likely to have used a condom with their most recent partner than people in class 1. A possible explanation for this contradictory finding might be that whereas in our study participants reflected on their condom use in the past and on current shame, in the study by Sales et al. (39) shame was identified as a predictor of prospective

Table 3. Probability of Response for Each Category of Outcome Variables, Including Health Goals, Anticipated Shame, and Impulsiveness (Negative Urgency), Among Participants in the iMPaCT Study, the Netherlands, 2016–2017

Outcome Variable	Latent Class	
	Class 1 (n = 488)	Class 2 (n = 325)
Health goals		
Low/medium	0.39	0.52
High	0.61	0.48
Anticipated shame		
Low/medium	0.49	0.33
High	0.51	0.67
Impulsiveness (NU)		
Low/medium	1.00	0.00
High	0.00	1.00

Abbreviations: iMPaCT, Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission; NU, negative urgency.

Table 4. Demographic and Behavioral Characteristics Associated With Latent Class Membership (Univariable and Multivariable Logistic Regression Analysis) Among Participants in the iMPaCT Study, the Netherlands, 2016–2017[a]

Characteristic	Latent Class				Crude		Adjusted[b]	
	Class 1 (n = 488)		Class 2 (n = 325)		OR	95% CI	OR	95% CI
	No. of Persons	%	No. of Persons	%				
Age, years								
18–21	188	38.5	131	40.3	1.00	Referent		
22–24	300	61.5	194	59.7	0.93	0.70, 1.24		
Sex								
Female	424	86.9	247	76.0	1.00	Referent	1.00	Referent
Male	64	13.1	78	24.0	2.09[c]	1.45, 3.02	2.13[c]	1.47, 3.09
Educational level[d]								
Low/medium	56	11.5	31	9.5	1.00	Referent		
High	432	88.5	294	90.5	1.23	0.78, 1.97		
Migration background								
Ethnic Dutch	390	79.9	267	82.2	1.00	Referent		
Non-Dutch	98	20.1	58	17.9	0.86	0.60, 1.24		
No. of sexual partners in past 4 weeks								
0–1	332	68.0	205	63.1	1.00	Referent	1.00	Referent
≥2	156	32.0	120	36.9	1.25	0.93, 1.67	1.25	0.92, 1.68
Condom use with most recent partner								
No	358	73.4	262	80.6	1.00	Referent	1.00	Referent
Yes	130	26.6	62	19.1	0.66[c]	0.47, 0.93	0.63[c]	0.44, 0.89

Abbreviations: CI, confidence interval; CT, *Chlamydia trachomatis*; iMPaCT, Mathematical Models Incorporating Psychological Determinants: Control of Chlamydia Transmission; OR, odds ratio.

[a] Numbers may not sum to totals because of missing data.

[b] Adjusted for all other variables shown in the table.

[c] $P < 0.05$.

[d] Educational level was defined as low/medium (no education, primary education only, lower general secondary education, or vocational education) or high (all other levels of education).

condom use (at the 6-month follow-up compared with baseline). Thus, high anticipated shame regarding an STI diagnosis might be associated with infrequent condom use in the past and could lead to increased condom use in the future. This suggests that STI-related shame could be used in clinical interventions by using it as a motivator, in a supportive manner, to increase condom use and chlamydia testing in the future (39, 40).

The LCA resulted in the identification of 2 distinct risk classes with differences in impulsiveness, anticipated shame, and health goals. These differences suggest that the response to interventions might be different in each latent class. For example, even though an intervention, such as motivational interviewing, is effective in increasing intentions to use condoms (24), it might not influence sexual risk decisions that impulsive individuals with low health goals make in real-life situations, when the temptations are stronger and overpower intentions (11). These findings highlight the need for a multidimensional approach, taking comprehensive information on demographic, behavioral, and psychological characteristics into account, which might improve assessment of the impact of interventions on chlamydia transmission.

Future research should focus on comparing the impact of interventions on the prevalence of chlamydia between risk classes with different psychological characteristics and identifying the most effective intervention for each risk class. In practice, this study might contribute to tailoring interventions to persons visiting STI clinics. For assessment of level of risk when people make an appointment for an STI test at STI clinics in the Netherlands, individuals provide information for triage, such as demographic characteristics and sexual behavior. Psychological variables, such as impulsivity or STI-related shame, can be measured with a few simple questions, and these questions could be added to the triage process.

An intervention strategy that could be used for impulsive individuals are time-based interventions, which are focused on an individual's preference to choose either smaller-sooner or larger-later rewards. Previous research taking individual differences in impulsive behavior into account has shown that time-based interventions effectively increase self-control

and reduce impulsive decisions among persons prone to impulsivity (41, 42). Another example is using STI-related shame to assess openness to behavior change or motivation to change behavior (39, 40). For instance, shame could be used to form implementation intentions. Implementation intentions are simple plans, in the form of statements such as "If I encounter situation X, then I will perform behavior Y." This could be implemented at STI clinics after self-evaluation during the consultation, tailored to characteristics of the individual, to increase condom use and chlamydia testing in the future. Furthermore, the multidimensional approach to identification of risk classes described in this study could be applied to other infectious diseases as well, since psychological characteristics also play a major role in the transmission of, for example, vaccine-preventable diseases (43) (e.g., opinions toward vaccination) and vector-borne diseases (44) (e.g., perceived risk of exposure).

In conclusion, people who belong to different chlamydia risk classes can be differentiated from each other by psychological characteristics that go beyond sexual behavior. Identifying characteristics of these specific risk classes in the population might provide valuable information on which interventions should be prioritized for each risk class in order to reduce the prevalence of chlamydia most effectively.

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