

CLINICAL AND TRANSLATIONAL SCIENCES, DOCTOR OF PHILOSOPHY (PH.D.) WITH A CONCENTRATION IN PSYCHIATRIC, BEHAVIORAL AND STATISTICAL GENETICS

Note: Admission to this program is temporarily suspended.

Program goal

The doctoral program in clinical and translational sciences offers a general curriculum, an interdisciplinary concentration in psychiatric, behavioral and statistical genetics and a concentration in cancer and molecular medicine.

Students who pursue the doctoral program in clinical and translational sciences will be grounded in a relative substantive area and be prepared to integrate data from multiple disciplines, have strong communication and computational skills and be sufficiently flexible to easily move among different projects and research venues.

Student learning outcomes

Students who complete the program should achieve the following core competencies:

1. Understand, integrate and apply relevant biomedical biobehavioral concepts and theoretical frameworks to research
2. Comprehend, select and apply the appropriate study design to address specific health issues
3. Critically review the scientific literature by applying sound research knowledge and principles to the review
4. Apply data collection processes and information technology to create, maintain and secure databases and other information
5. Apply ethical principles to study design, data collection and dissemination
6. Devise an analysis plan (statistical methodology) and analyze data using methods appropriate for the study design and type of data to be obtained
7. Identify, interpret and implement relevant laws, regulations and policies related to specific studies and/or programs
8. Plan, incorporate and use appropriate methods for the dissemination and adoption of clinical research findings
9. Manage as a clinical translational research team leader the fiscal, personnel, facilities, regulatory assets and scientific integrity of a funded clinical research program
10. Use knowledge and skills related to leadership, team-building, negotiation, conflict resolution, group process and principles of ethical decision-making to manage a research team and build transdisciplinary collaboration
11. Identify and coordinate institutional resources needed to carry out theoretically based and scientifically sound high-quality funded research
12. Effectively communicate specialist-to-specialist

13. Effectively communicate specialist knowledge to nonspecialists and laypersons

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the Graduate School website (<http://www.graduate.vcu.edu>) and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the academic regulations section for additional information on academic regulations for graduate students. (<http://bulletin.vcu.edu/academic-regs>)

Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the academic regulations section for additional information on degree candidacy requirements. (<http://bulletin.vcu.edu/academic-regs/grad/candidacy>)

Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the academic regulations section for additional information on graduation requirements. (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info>)

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Admission requirements

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
Ph.D.	Fall (Preferred). Rolling admissions.	Applications received by Jan 10 receive priority	GRE, TOEFL if relevant

In addition to the general admission requirements of the VCU Graduate School (<http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements>) all applicants must provide the following:

1. A statement of purpose for application to the program. The document should be 1.5 or double-spaced with one-inch margins, in a font size no smaller than 11 points. The statement of purpose should cover the below issues in two to five pages:
 - a. Why the applicant wishes to pursue a Ph.D. in the CTS-PBSG concentration
 - b. Background experience relevant to pursuing a Ph.D. in the CTS-PBSG concentration
 - c. Research interests and potential faculty mentors with whom the individual would want to work
 - d. Description of the applicant's career goals
2. Scores from the Graduate Record Examination (GRE). Applicants **must** score at the 75th percentile or above in all sections of the GRE.
3. International applicants must also provide, to the VCU Global Education Office, scores from the Test of English as a Foreign Language or International English Language Testing System.

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Degree requirements

All students are expected to be actively engaged in research throughout the duration of the Ph.D. program. Students are generally admitted under a mentorship model, meaning that they will begin research under the supervision of faculty advisers to whom their research interests most closely align. Other didactic experiences include the weekly seminar series (both at the VIPBG and in external departments) as well as participation in workshops and scientific meetings of relevance to the student's research area.

The curriculum provides a strong grounding in fundamental concepts while emphasizing aspects of research design and technology that are broadly applicable across disciplines in industrial, government and academic settings. A series of elective courses will then provide an advanced base of knowledge focused on a student's areas of interest.

In addition to general VCU Graduate School graduation requirements (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info>), students are required to meet the following:

1. Credit hour requirements: Students are required to complete course work in core and elective courses and to conduct significant research. In order to earn the Ph.D., students must complete a minimum of 54 credit hours: 32 core and elective courses as well as 22 in directed and dissertation research that provide a sound foundation in clinical and translational research principles. Students will also participate in seminar and workshop experiences that place them in the midst of the research process from theoretically based hypothesis generation through grant writing, study conduction, and, ultimately, data analysis and manuscript preparation. This program also includes a rigorous

interdisciplinary research component comprising directed research and dissertation hours.

2. Transfer and M.S. credit hours: Graduate-level course work completed prior to matriculation into the program, including course work taken in another program at VCU or at another institution, shall be evaluated to determine whether it can be used to fulfill degree requirements of this program. Transfer of credit hours will be limited to those allowed by the university. A minimum grade of B is required for credit hours to transfer.
3. Grade requirements: Degree applicants must achieve an overall GPA of 3.0 (B) with a grade of C in no more than two courses per the VCU Graduate Bulletin. The GPA for graduation shall be based on all graduate courses attempted after acceptance into the program. Students who receive a grade lower than a B in any of the required PBSG core courses will be subject to remedial action as determined by their advisory committee in conjunction with the PBSG program director to ensure that there is adequate mastery of the material. All remedial action must be undertaken and completed to the committee's satisfaction before the student is eligible to begin their qualifying exams.
4. Research advisers and committee: The director of the CCTR education program or the director's assigned designee will assist the student with initial course selection and provide advice concerning the program. All students should select their master's or doctoral co-advisers and finalize the composition of their research advisory committee prior to the end of the second semester of study.
5. The student's co-advisers shall provide each student enrolled in the master's or doctoral program with individualized recommendations regarding course work selection, workshop experiences and the direction of their research. It is essential that each student be comprehensively assessed in the area of their methodological and research background. Particularly in the case of those pursuing the Ph.D., recommendations will be made to ensure that each student has acquired the needed substantive research background necessary for doctoral-level work. Thus, the total credit hours required for graduation will be determined on a case-by-case basis by the individual student's research advisory committee.
6. The committee will consist of a minimum of five members, all of whom must be members of the VCU graduate faculty. Note: Individuals who are not already graduate faculty members must apply to the dean of the Graduate School for temporary affiliate membership. The composition of the research advisory committee shall be such that the significant areas of the student's research focus are represented. To foster the interdisciplinary intent of this degree program, at least one member of the committee shall be from a school other than those of the student's co-advisers. Final approval of each student's advisory committee membership shall rest with the CCTR Education Program committee.
7. Admission to candidacy for the Ph.D. Before admission to candidacy for the Ph.D., students must have:
 - a. Completed all required course work (as noted above, through a comprehensive screening process students will have been evaluated to assure that they have grounding in a relevant substantive content area and have taken the needed course work in statistics, methodology and research so that they are able to pursue doctoral-level research)
 - b. Successfully completed an oral examination
8. Oral examination: Upon successful completion of all required didactic course work, not including seminars and workshops and submission and acceptance of a research proposal, students shall take an

oral examination administered by the student's research advisory committee. The exam shall be based on a defense of the student's proposed dissertation research project, which shall be constructed in the format of an NIH grant submission and all other subject areas deemed appropriate by the committee. All advisory committee members must vote on the student's performance as either Pass or Fail. A student may pass the exam with no more than one negative vote. Upon successful completion of the oral examination, the student is officially entered into candidacy and permitted to refine their proposed dissertation research and submit it for final committee approval before initiating the project (see below). An unsuccessful oral examination shall require re-examination within a time period determined by the committee. Only one oral re-examination is permitted.

9. Dissertation research/proposal: Students must propose and conduct a substantial original clinical and/or translational investigation under the supervision of the research advisers and advisory committee. The student can refine the research proposal which served as the foundation of their oral examination in consultation with the research advisers and advisory committee or propose a new novel research proposal. The proposal, which shall be constructed in the format of an NIH grant submission, should include information on the general purpose of the research, background information on the research topic (including a review of the relevant literature), a rationale for the project, a statement of the hypotheses to be investigated or research questions to be answered, and proposed methods and statistical analyses. Once the student has received the committee's approval, they can initiate their dissertation research.
10. Dissertation research project: The research project should represent a significant contribution to the body of knowledge in its field and should be deemed publishable in refereed journals. The emphasis of the research conducted by students in this program shall be on clinical and translational interdisciplinary research, incorporating two or more disciplines as well as a systems approach. This emphasis will be fostered by the requirement of having at least one faculty member on the research advisory committee from a school or college different from that of the research advisers, thereby exposing students to different perspectives on the same problem and assisting students in developing multidisciplinary approaches to their research.
11. Dissertation defense: Students shall prepare a written dissertation describing the completed research using a format approved by the VCU Graduate School. An oral defense of the dissertation, under the direction of the research advisory committee and open to all faculty members, shall be scheduled to examine the student's research, dissertation documentation and underlying fundamental knowledge across the disciplines encompassed by the student's research. An announcement of the oral defense, including the candidate's name, dissertation title and the day, place and time of the defense, shall be made at least 10 working days in advance of the defense. Following the defense, all committee members shall vote on the acceptability of the dissertation. A student may pass the oral defense, signifying that the research advisory committee has accepted the dissertation, with no more than one negative vote. Upon successful completion of the defense and dissertation, the student may apply for graduation from Virginia Commonwealth University with the degree of Doctor of Philosophy in Clinical and Translational Sciences with a concentration in psychiatric, behavioral and statistical genetics.

Research advisers and committee

Each student in the program will have both a research and a clinical mentor (these could be the same or different faculty members). This team-based mentoring approach will facilitate the translational aspects of the Ph.D. students' projects and may actually serve to stimulate new translational projects and collaborations at VCU. The research mentors in the program will be chosen based on demonstrated research expertise in the area of cancer or molecular medicine, excellent mentoring skills, and research funding to support the Ph.D. student. Clinical mentors will be chosen based on clinical expertise and mentoring excellence. Through the clinical mentor, the trainee will have opportunities to be exposed to clinical practice, including clinics and surgeries, clinical laboratories, the complexities of clinical trials, and other clinical activities. The clinical activities are expected to consist of approximately one hour/week on average for Ph.D. students, but would be more intensive for M.D./Ph.D. students, in keeping with the existing requirements for that program. Both the research and clinical mentor would be on the thesis committee, which would comprise a total of five faculty members, at least three of whom are CMM faculty members. For M.D./Ph.D. students, their clinical mentors will be the same faculty member serving as their Foundations of Clinical Medicine preceptors. The students' mentors and thesis committee will advise the students as they prepare career development plans in the second year in the program. The career development plan will be required because translational science is by definition an interdisciplinary and novel career path for students.

Qualifying exam

Students in good academic standing who have completed all of their required academic core course work will spend the summer after the second year preparing for the qualifying exam. The qualifying exam will consist of writing a review paper of no more than 30 double-spaced pages, excluding references. In keeping with the interdisciplinary nature of the program, the review paper must demonstrate mastery across the core areas represented in PBSG (genetics, phenotyping, methods). The topic of the review paper should be developed by the students in consultation with their advisers. The title of the review paper, along with a short abstract (no longer than one single-spaced page) describing the proposed content should be submitted to the PBSG program director by June 15 for review by the qualifying exam committee. The QEC will review the proposal to ensure that the topic of the review paper is appropriate in that it allows the student to demonstrate command of the literature and interdisciplinary breadth. The committee will make decisions about adequacy of the review paper and, if necessary, work with the student to make revisions within approximately 14 days. Once the topic has been approved by the QEC, the student may begin writing. The review paper must be the student's own work. Drafts may not be reviewed by the student's adviser or other faculty, fellows or students. The final review paper must be submitted to the advisory committee by Aug. 1.

An oral examination of the paper administered by the student's advisory committee and the QEC must be scheduled to take place approximately two weeks after submission to evaluate the student's command of the material and to give the committee opportunity to ask questions and provide feedback. A pass/fail decision will be made at that time. Unsuccessful completion of the qualifying exam will require re-examination within a period of time determined by the committee and PBSG program director. The content of the re-examination will also be determined by the committee and PBSG program director on an individual basis. In some cases this could involve a revision of the review paper or particular sections; in other cases, it may involve a repeat of the entire process including selection of a new topic and submission of a new

review paper and/or repeat of the oral defense. Only one reattempt to pass qualifying exams is permitted. Students who do not pass their qualifying exams upon their second attempt will be dismissed from the program. Upon successful completion of the oral examination, the student is then officially entered into candidacy for the Ph.D. and permitted to refine their proposed dissertation research and submit it for final committee approval before initiating the project (see below).

Admission to Ph.D. candidacy

Students will have written and oral qualifying examinations, based on writing a grant proposal describing their proposed thesis research and orally defending the proposal with their thesis committee. Before admission to candidacy for the Ph.D., students must have (1) completed all required course work as described above and (2) successfully completed a qualifying exam.

Dissertation proposal defense

Students who have completed the qualifying exam and the second year project are eligible to propose and defend their dissertation. The proposal should be constructed in the format of an NIH grant submission. The proposal must consist of an original research idea generated by the student in consultation with their adviser. The dissertation proposal defense should generally be completed during the fall semester of the third year. Students shall prepare a written dissertation describing the completed research using a format approved by the VCU Graduate School. An oral defense of the dissertation, under the direction of the research advisory committee and open to all faculty members, shall be scheduled to examine the student's research, dissertation documentation and underlying fundamental knowledge across the disciplines encompassed by the student's research. An announcement of the oral defense, including the candidate's name, dissertation title, and the day, place and time of the defense, shall be made at least 10 working days in advance of the defense.

Following the defense, all committee members shall vote on the acceptability of the dissertation. A student may pass the oral defense, signifying that the research advisory committee has accepted the dissertation, with no more than one negative vote. Upon successful completion of the defense and dissertation, the student may apply for graduation from Virginia Commonwealth University with the degree of Doctor of Philosophy in Clinical and Translational Sciences with a concentration in psychiatric, behavioral and statistical genetics.

Time limit

All requirements for the Ph.D. must be completed within eight years from the date of admission to the degree program.

Concentration in psychiatric, behavioral and statistical genetics

The concentration in psychiatric, behavioral and statistical genetics was designed by faculty at the Virginia Institute for Psychiatric and Behavioral Genetics. This interdisciplinary institute brings together faculty with a wide range of scientific backgrounds ranging from statistical and molecular genetics to epidemiology, psychology and psychiatry, all with the joint focus of understanding how genetic and environmental factors impact the development of psychiatric and substance use disorders and related behavioral outcomes.

Faculty members work across twin and family studies, gene identification projects and genetically informative longitudinal, community-based samples. Faculties also are involved in statistical methods

development for these projects. Students in the PBSG concentration obtain interdisciplinary training with course work in human genetics, psychology/psychiatry, biostatistics and epidemiology. Students can tailor their training and research experience to their particular career goals by selecting electives in their focused area of interest.

First-year project

All students are required to conduct a first-year research project. The nature of the first-year project will vary according to the area of the student's research. This project must be written up by the student and submitted to the PBSG program director and it must follow a scientific paper format and include an abstract, introduction, methods, results and discussion sections. The depth of the individual sections of the project will vary according to the nature of the project. Although the write-up of the first-year project is not required to be of publication quality, it should demonstrate a basic command of the research process and an ability to integrate relevant literature and nascent data into testable hypotheses. The adviser and PBSG program director will review, consult and make a decision about the adequacy of the submitted first-year project write-up. Feedback will generally be given within 14 days of receipt of the write-up. Students cannot move on to the second-year project until the first-year project has been signed off on by the adviser and PBSG program director. Students must give a presentation as part of the VIPBG seminar series on their first-year projects at some point during the spring semester of the first year. Students should aim to submit their written first-year projects prior to the start of the fall semester of the second year of graduate study.

Second-year project

The second-year research project can be a continuation/extension of the first-year project or consist of a new research question. The second-year project should be developed in collaboration with the student's advisory committee. This should happen soon after the first-year project has been signed off on (if not before). Students must give a presentation on their second-year projects at some point during the spring semester of the second year. Second-year projects are expected to be of publication quality and should follow a scientific paper format, which includes an abstract, introduction, methods, results and discussion sections. The advisory committee and PBSG program director will review, consult and make a decision about the adequacy of the second-year project, generally within 14 days of its receipt. Students cannot progress to the oral defense of the dissertation proposal until the second year-project has been signed off on by the advisory committee and PBSG program director. Students should aim to have their second-year projects completed early in the fall semester of their third year of graduate study.

Curriculum requirements

Required courses (29-32 credit hours)

Course	Title	Hours
BIOS 543 or STAT 543	Graduate Research Methods I Statistical Methods I	3
BIOS 544 or STAT 544	Graduate Research Methods II Statistical Methods II	3
CCTR 690	Research Seminar in Clinical and Translational Sciences	1
EPID 571	Principles of Epidemiology	3
HGEN 501/BIOL 530	Introduction to Human Genetics	3
HGEN 502	Advanced Human Genetics	3
HGEN 603	Mathematical and Statistical Genetics	3

HGEN 620	Principles of Human Behavioral Genetics	3
OVPR 601	Scientific Integrity	1
or OVPR 602	Responsible Scientific Conduct	
or OVPR 603	Responsible Conduct of Research	
PSYC 616	Psychopathology	1,3
PSYC 691	Special Topics	1-3
PSYC 700	Grant Writing	3

Electives (variable)

A minimum of three elective courses must be taken and can be selected from the range of classes available across VCU departments, including the departments of Psychology, Human and Molecular Genetics, Biostatistics and/or any other relevant course that fits with the student's primary focus and interests, in consultation with the student's research advisory committee.

Research (variable)

Course	Title	Hours
CCTR 697	Directed Research in Clinical and Translational Sciences	1-15
CCTR 898	Dissertation Research in Clinical and Translational Sciences	1-10

Total graduate credit hours required (minimum) 54**Graduate program director**

Teraya Donaldson, Ph.D.
 Assistant director of education
 Center for Clinical and Translational Research
cctred@vcu.edu
 (804) 828-6671

Additional contact

T'Keyah Johnson
 Education coordinator
 Center for Clinical and Translational Research
johnsontc3@vcu.edu
 (804) 628-5414

Program website: [cctr.vcu.edu/education](http://www.cctr.vcu.edu/education) (<http://www.cctr.vcu.edu/education>)