**SPONSOR STATEMENT**

1. **Research Support Available**

**A.1. Sponsor: Chelsea Helion, Ph.D.**

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| --- | --- | --- | --- | --- |
| **Role** | **Funding Source** | **Project Name** | **Dates** | **Total Costs** |
| co-I | NSF - 2123474 | Distortions in memory for aversive naturalistic events. | 2021 - 2025 | $999,864 |
| co-I | SRNDNA | Deconstructing How Event Memory Shapes Decision-Making in Older Adults | 01/01/2023 – 12/32/2024 | $24,000 |
| PI | NSF | NCS-FO: Affective Influence on Naturalistic Moral Judgment | 2023 - 2026 | *Applied* |

If needed, I will support the applicant’s research and training expenses via the primary sponsor (Helion’s) startup fund (totaling over $200,000 across resources and imaging funds), which would provide support for the research/training plan proposed during the F99 period.

**A.2. Co-Sponsor: Jason Chein, Ph.D.**

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| --- | --- | --- | --- | --- |
| **Funding Source** | **Title** | **PI** | **Dates** | **Total (Site) Costs** |
| R01 HD098097 | Origins and Outcomes of Smartphone and Social Media Habits Across Development | Chein | 2021-2026 | $1.9 million |
| Pennsylvania Dept. of Health (PACURE) | *Vascular contributions to mechanisms and biomarkers of Alzheimer’s disease* | Fossatti | 2020-2024 | $3.8 million |
| R01DC013063 | *Early Detection and Treatment of Emerging Cognitive-Linguistic Impairment in Minority Cognitive Aging and Primary Progressive Aphasia* | Reilly | 2021-2024 | $470,000 |

### Sponsor's/Co-Sponsor’s Previous Fellows/Trainees

Dr. Helion was an F32 recipient, and is currently the primary mentor for three pre-doctoral trainees, and am a co-mentor for one pre-doctoral trainee. The applicant (William Mitchell) is my (Helion) most senior pre-doctoral trainee. A representative list of current trainees is listed below:

Sponsor’s Predoctoral trainees:

1. William Mitchell, Cognition and Neuroscience area, Temple University
2. Virginia Ulichney, Social area, Temple University
3. Helen Schmidt, Social area, Temple University
4. Joy Ham (co-mentee), Cognition and Neuroscience area, Temple University

**B.2. Co-Sponsor Chein** currently has two graduate students and one post-doctoral fellow (Lena Skalaban, Ph.D.). Dr. Chein has graduated eight doctoral students from his laboratory, and has sponsored three prior post-doctoral research fellows.

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| --- | --- | --- | --- | --- |
| **Student** | **Time Spent in Laboratory** | | **Institution** | **Title** |
| Nicole Strang (PD) | 2011-2013 | Wayfair, Inc. | | Data Science Manager |
| Elizabeth Shulman (PD) | 2014-2015 | Brock University | | Assistant Professor |
| Lauren Sherman (PD)† | 2015-2018 | Facebook, Inc. | | UX Researcher |
| Dustin Albert | 2006-2010 | Bryn Mawr College | | Associate Professor |
| Alexandra Morrison | 2006-2011 | Cal State Sacramento | | Associate Professor |
| Ashley Smith | 2010-2015 | NIMH | | Postdoctoral Scholar |
| Kara Blacker | 2011-2013 | Naval Medical Research | | Staff Scientist |
| Karla Fettich | 2014-2016 |  | | Data Analyst |
| Gail Rosenbaum | 2012-2017 | New York University | | Postdoctoral Scholar |
| Henry Wilmer | 2012-2017 |  | |  |
| Jamielyn Samper | 2015-2021 | University of Pennsylvania | | Program Researcher |
| Maria Brucato  Elizabeth Beard  Michelle Chiu  Busra Tanriverdi  Steven Martinez | 2017-2022  2018-2023  2018-2022  2020-present  2021-present | Jefferson University  Children’s Hospital of Phila.  Temple University  Temple University | | Research Analyst  Data Analyst |

1. PD indicates postdoctoral trainee. †NSF Postdoctoral Research Awardee.
2. *Co-Sponsor Chein has also been the Co-Sponsor of two previous F31 recipients of graduate students in the clinical psychology program and one in the Cognition & Neuroscience program at Temple.*

### Training Plan, Environment, and Research Facilities

### C.1. Training Plan This training plan has been designed to allow the candidate, William Mitchell, to develop as an independent scientist. We have developed this plan to build upon and extend William’s current strengths in programming and multivariate neuroimaging analyses, increasing his competence in computational analytic approaches, and preparing him to pivot his research program to social developmental neuroscience during his postdoctoral training period. William is a uniquely talented coder with incredibly strong statistical aptitude, receiving the D-SPAN would allow him to gain additional and critical training in social computational methods. This training, along with the training in developmental neuroscience in the K00 period, would set him up to be a uniquely interdisciplinary researcher, who will apply cutting edge methods in social and cognitive neuroscience to examine developmental questions. His training plan will include (1) learning computational neuroscience methods that he can apply to naturalistic neuroimaging data; (2) developing expertise in the social adolescent neuroscience literature, and (3) training for his future as a principal investigator. This training, and the resulting research products, will make him competitive for R1 faculty positions.

1. Learning computational neuroscience methods and analyses

During his time as a doctoral student, William has focused on researching affective representation and regulation using both naturalistic neuroimaging (i.e., emotion-eliciting videos) and quasi-naturalistic emotional contexts (i.e., a real-world haunted house). Through these research projects, he has learned a variety of methodological and analytic approaches, including representational similarity analysis (RSA), behavioral measurement/self-report question design, and linear mixed modeling. William is currently collecting fMRI data for the uncertainty video paradigm outlined in the F99 section of the proposal in an adult sample. The preliminary results from this project (as outlined in the *Research Strategy*) indicate that the neural circuitry previously implicated in neuroimaging studies examining ambiguous decision-making also tracks ratings of outcome-based certainty. This is notable, as it connects ambiguity (a stimulus-dependent) feature with a metacognitive evaluation of one’s current state (level of uncertainty). This project served as the basis for William’s proposal, and given the previously identified developmental differences in decision-making under risk and uncertainty, he was particularly motivated to design a project where these processes could be explored across development. However, the type of stimuli that William is interested in working with (naturalistic film stimuli, coupled with free recall) usually necessitates mastering complex methods, including but not limited to functional hyperalignment (for aligning voxels across participants based on activity patterns), Generalized Estimating Equations (GEE) (for modeling autocorrelated data) and Intersubject Correlation (ISC). Notably, given the relative novelty of the usage of this kind of stimuli in neuroimaging research, these methods are at the “cutting edge”, and are being continually extended and updated. The goal of this training program is to prepare William to make novel contributions in this exciting space, and to extend the use of some of these approaches into developmental contexts.

To garner these skills, William will receive one-on-one training with Dr. David Smith in the application of computational neuroscience approaches, including techniques to address autoregression within neuroimaging data, conducting functional hyperalignment and applying ISC analyses to neural data. Dr. David Smith will meet monthly with William to discuss study progress, open-science practices, and workshop issues that develop. Dr. Helion will also instruct William in a one-on-one capacity in the application of GEE models to address autoregression in behavioral data. William is an excellent programmer and is passionate about open-source research tools. As such, William has been tasked with adapting the functions that he will or has developed to build naturalistic video studies, organize the data that they produce, and generate analyses into publicly available open-source packages to deepen his understanding of their application and increase his contributions to the field. He will attend the fMRI Journal Club sponsored by the Temple University Brain Research & Imaging Center (TUBRIC) to improve his general understanding of fMRI. William will receive training and exposure in computational methods beyond Temple by attending the Conference for Computational Cognitive Neuroscience in both years, ideally presenting his dissertation work at it in the second year. Further, William plans to apply for summer intensive workshops that bolster computational neuroimaging techniques, such as Neuromatch or MiNDs. In the subsequent year, William will volunteer as a teaching assistant at Neuromatch or Neurohackademy to further solidify the skills and techniques that he has learned. However, if he is unable to attend to these workshops, the local training opportunities should be more than enough to develop these skills. This will adequately fortify William’s theoretical and methodological foundations before he advances to his postdoctoral training.

2. Developing expertise in the social adolescent neuroscience literature

William’s primary sponsor, Dr. Helion is an expert in social and affective neuroscience, and received extensive postdoctoral training in developmental neuroscience. William’s co-sponsor, Dr. Chein, is an expert in developmental neuroscience, and the director of Temple’s TUBRIC Imaging facility. William’s consultant, Dr. Steinberg, is a field-leading developmental researcher with an illustrious career and particular expertise in adolescent social neurodevelopment. William has expressed interest in development topics early in his graduate studies and has worked on pre-collected developmental datasets, but does not have experience directly working with adolescents in an experimental neuroimaging context or analyzing adolescent data. While William has developed exceptional study design and statistics skills and will build upon these skills during this training plan, applying these skills to developmental samples will require additional training with this developmental samples. As such, he will receive instruction and training from his advisory team, which is exceptionally well-suited for this task, so that he can be prepared to smoothly transition to a developmental neuroscience lab during his postdoctoral training.

In addition to William’s regular meetings with both Dr. Helion and Dr. Chein, at which adolescent neurodevelopmental literature will be reviewed, William will also meet monthly with Dr. Steinberg with the sole purpose of discussing the adolescent social neurodevelopmental literature. Under the guidance of Dr. Steinberg, Helion, and Chein, William will complete a guided review of the extant literature with the intention of ultimately producing a review paper synthesizing current literature on domain-specificity in developmental uncertainty judgments. William will attend the Flux Conference yearly to learn the most cutting-edge developmental neuroscience literature and network with potential future postdoctoral labs. William will discuss and weigh his postdoctoral options with his adolescent neuroscience advising team determine the best possible lab fit for his skills and interest. Lastly, William will attend the regular monthly lab meetings of the Developmental Psychology labs which often feature developmental presentations, speakers, and ethics discussions to develop a greater appreciation for the developmental psychology field more broadly. As William prepares to enter the postdoctoral phase, one-one-one meetings will transition to discussions of how the predoctoral paradigm can be best adapted to adolescent samples to ensure that William is as prepared as possible when entering the next stage of his career.

3. Professional skills development

We propose a three-pronged approach for increasing William’s professional skills development. The first focuses on the development of research-related products (e.g., manuscripts, grants). The second focuses on building a successful research team. The third focuses on collaboration development and networking.

Development of research-related products.

*Manuscripts.* William is already building an impressive publication record at his early career stage. This includes a first-author developmental RSA paper, published in *SCAN*. This paper perfectly reflects William’s interests in emotional experience in development and multivariate neuroimaging analyses. William also has a first-author manuscript (see *Mitchell Biosketch)* examining emotion regulation strategy usage in quasi-naturalistic contexts. His planned dissertation research (the F99 portion of his proposal) builds on this program of research by connecting naturalistic methods with multivariate neuroimaging analysis. William will use this momentum to submit or contribute to one to two manuscripts per year for publication. The combination of cross-disciplinary theory and social computational methods will make him very competitive on both the postdoctoral and tenure-track job markets.

*Grants.* William has already completed a weekly professional development seminar as part of his formal coursework, and a course specifically focused on writing NIH fellowship grants (taught by our colleague Lauren Alloy). Primary sponsor Helion will also meet regularly with William to discuss grant preparation across multiple funding agencies/mechanisms. William and Helion currently meet regularly (~1/week) to discuss his ongoing projects and identify relevant funding mechanisms. William and co-sponsor Chein and consultant Steinberg will meet regularly (~1/week; ~1/month) to discuss situating William’s work with an eye towards developmental studies and outcomes. William and Consultant David Smith will meet regularly (~1/month) to go over neuroimaging methods and troubleshoot analytic strategies.

Building a successful research team

*Informal training.* William will meet regularly with primary sponsor Helion to discuss his ongoing projects, how to mentor his undergraduate research team, and responsible conduct of research practices. William attends the Social and Affective Neuroscience (SAN) Lab’s weekly lab meeting, which includes presenting his work, and giving feedback to his colleagues/peers. In lab meeting we discuss a variety of issues relevant to professional development, including (but not limited to) manuscript preparation, study design, neuroimaging statistical analysis, and article review. William also attends the Helion/Chein joint lab meetings (biweekly) in which the two labs discuss areas of overlap and present research.

*Mentoring opportunities.* William is an unparalleled research mentor for undergraduate research assistants and more junior graduate students. Indeed, William is often an “in demand” resource for individuals not only in his “home” lab (the SAN lab) but also across the department, for his coding and analytic abilities. Moreover, this effort has already been recognized at the departmental level, as William has received an award for being the “Mentor of the Year” from the department’s honors program. This reflects William’s clear commitment (and aptitude!) for mentoring students. William’s enthusiasm for training others is perhaps most evident in William’s leadership role in the department’s coding outreach group (COG). This involves actively collaborating with other students in the department to develop coding related programming for individuals at all levels (undergraduate, graduate, postdoc, faculty). William’s workshops primarily demonstrate data analysis in R and Python, generating Shiny applications, and creatively visualizing data. These workshops (including all recordings and code) are available to the wider scientific community. William has been a critical part of my lab mentoring team, and specifically, a notable contributor to the lab’s diversity-related mentoring initiatives. Primary sponsor Helion is the co-founder of the Building Research Independence by Developing Goals and hands-on Experience (BRIDGE) program, which aims to increase the participation of under-represented groups (as identified via NIH guidelines) by providing students with paid summer positions in research labs in Temple’s Psychology and Neuroscience department. William has co-mentored (with Helion) two undergraduate students, resulting in successful departmental poster presentations. He has also mentored a student through the department’s Mid-Atlantic Diversity Scholars (MiNDS) summer program. He will continue to mentor students through the BRIDGE and MiNDS programs, and will work closely with mentees to develop presentations at regional and national conferences and manuscripts for social and affective neuroscience journals.

*Collaboration development and networking*

As William moves into the next stage of his career, it will be critical for him to build his professional network through developing strong collaborations with researchers across multiple disciplines (e.g., developmental neuroscience, social neuroscience, affective neuroscience).

*Networking opportunities.* During the training period, William will give oral presentations at conferences and local lab meetings. William has experience in this area, including co-chairing a symposium (and giving a talk) on contextual influences on emotional experience at the annual meeting of the American Psychological Society (APS). He also gave a talk at BJ Casey’s lab, a trailblazer in developmental neuroscience research. One goal for his remaining doctoral training is to apply to give a talk and/or organize a symposium at the Society for Affective Neuroscience and FLUX Congress (the annual meeting of the Society for Developmental Neuroscience). The Philadelphia area is uniquely well suited for academic development given its proximity to multiple R1 universities both in Philadelphia proper, but also in New Jersey and the New York metropolitan area. We (co-sponsors) will use our professional networks to ensure that William has opportunities to present his research at local lab meetings and regional mini-conferences. William is an extremely clear, charismatic, and talented public speaker, and we are excited to see him develop this skill and disseminate his research more widely. William will also grow his professional network through participation in collaborative neuroimaging workshops.

### 4. Environment and Research Facilities:

William’s co-sponsors have a history of collaboration, are co-authors on an affective neuroscience paper, and hold bi-weekly joint lab meetings. Dr. Chein is also the director of Temple’s TUBRIC imaging facility, a state-of-the-art facility for neuroimaging research. Dr. Chein and Dr. Helion informally meet regularly, and will develop a formal meeting schedule (along with William) as part of this proposal.

Temple University is an exciting and dynamic environment for conducting neuroscience research. The department is comprised of faculty across multiple subareas (Social, Developmental, Cognition & Neuroscience, and Clinical), and thus has a strong multidisciplinary focus. In particular, the Cognition & Neuroscience program (where William is a student) is a particularly collaborative group. Many faculty publish together (including the two sponsors on this application), and students are frequently co-mentored. One of Temple’s strengths as a program is its concentration in quantitative methods, which William has specialized in, and is taught by faculty across multiple sub areas. This has set William up well with the kind of advanced analytic knowledge and skill set that he will need to conduct the proposed research.

Specific available resources and equipment are detailed in the **Facilities and other Resources** and **Equipment** sections of this proposal. They are summarized below:

* A Siemens MAGNETOM Prisma 3-T whole-body 3T MRI scanner in the basement of Weiss Hall. This imaging center – TUBRIC -- was specifically designed to be welcoming to children and patient populations.
* A high-performance computing cluster called Owl’s Nest, to be used for computationally-demanding analyses.
* Site licenses and/or subscription access for essential software and database applications, including MATLAB, SPSS, SAS, RedHat, Qualtrics, Adobe Cloud Services, MS Office, etc.
* A library of commonly-used neuropsychological testing materials (e.g. WAIS, WMS, VOSP, etc.)

### D.Number of Fellows/Trainees to be Supervised During the Fellowship

Dr. Helion supervises 3.5 predoctoral students (including the applicant). Dr. Chein supervises 2 predoctoral trainees.

### E. Applicant's Qualifications and Potential for a Research Career

William is an exceptional scientist, and poised to have a research career that will be transformative for the field. William is innovative, hard-working, and is an unparalleled critical thinker. He is genuinely enthusiastic about pushing the envelope on new quantitative and neuroimaging methods, and through this training program, will develop the tools to be at the cutting edge of the field. William’s scientific talent has no ceiling – his capacity to learn and adopt new methods and tools, and to connect them to theory, is unparalleled.William graduated *magna cum laude* from Loyola University Maryland, where he a recipient of both the Presidential and University scholarships. Prior to matriculating in our program, William worked as a research coordinator at both Johns Hopkins University and the Children’s Hospital of Philadelphia (CHOP; University of Pennsylvania). It is this latter experience, of conducting research with children and families in a clinical context, that speaks to his early and continuing commitment to improving the health and well-being of developmental populations.

### While William entered the lab without a coding background, you’d never know it. Within three short years he has quickly established himself as one of the department’s coding experts, and was selected to co-lead the department’s student-run Coding Outreach Group (COG). This selection speaks not only to William’s immense talent in the space, but also how clearly he is able to communicate complicated methods and concepts to others. This combination – of strong quantitative skills coupled with clear communication at all levels – is *incredibly* rare, and underscores how talented of an academic William will be when he runs his own lab. In fact, it is often easy to forget that William is a PhD student instead of an advanced postdoc. He is uniquely talented at task and program management. This was likely fostered in his earlier experiences at CHOP, where he oversaw database development and specimen collection of pediatric gastroenterology samples (i.e., enteroids), resulting in one of the largest databases of this type of tissue in the country. That William was entrusted with this important of a task, with clear clinical and research ramifications for many individuals across the country, speaks to his sense of responsibility, competence, and skill with complicated data collection and project oversight. Truly, William will *excel* as the PI of a lab one day – his skillset at this early stage is unmatched by many of his peers, and speaks to his immense talent.

### In his training-to-date, William has developed many skills that will be valuable for his planned interdisciplinary research career. This includes multivariate neuroimaging analytic approaches (RSA), time series data analysis, physiological data collection, and structural and functional fMRI data collection. William recently published a first-author paper that used RSA to examine neural similarity in children and adults as they viewed positive, negative, and neutral film clips. He found that children exhibited higher levels of pattern similarity in the ventromedial prefrontal cortex (vmPFC) relative to the amygdala and ventral striatum. Notably, this pattern was not observed in adults, who showed comparatively low (relative to children) levels of pattern similarity across all three regions. This may be indicative of developmental differences in appraisals of emotional meaning for complex affective stimuli. For this work, William received a SANS Poster Award and a Best Poster Award from the Society for Personality and Social Psychology’s Emotion preconference.

### William recently completed another first-author manuscript examining emotion regulation strategy usage in high-intensity emotional contexts. Prior research had found an association between emotional intensity and emotion regulation strategy choice, such that individuals prefer to engage in low-effort strategies (e.g., distraction) when regulating emotion towards high-intensity emotional stimuli and prefer high-effort strategies (e.g., reappraisal) when regulating emotion towards low-intensity emotional stimuli. William had hypothesized that this pattern may reflect how the association has typically been tested (i.e., static or decontextualized images or auditory sounds) in the lab rather than being a more general pattern in real-world emotional contexts. Leveraging a quasi-naturalistic and high-intensity affective environment (a local haunted house during Halloween), William found that this previously identified pattern did *not* reflect patterns of recalled strategy usage. Taken together, this project speaks to William’s immense creativity as a researcher, and his unique ability to link extant theory to complex naturalistic study contexts.

### During the past year, William has begun to examine the emotional ramifications of uncertainty, with an aim to identity the neural and behavioral bases of social and non-social uncertainty. This work has served as the foundation for this proposal. He has begun to collect preliminary neuroimaging data (see *Research Strategy*) for his proposed work. To conduct this work, William has learned how to code (and troubleshoot) tasks in Python, and has reached level 3 training in order to operate the scanner to collect data. As he begins to transition to developmental data collection for his postdoctoral training, co-sponsor Chein and Consultant Steinberg’s background and professional network in developmental neuroscience will be incredibly valuable. Primary sponsor Helion has experience in advanced quantitative methodology (e.g., GEE), and will help William develop his skills in this area. Although William his highly advanced at this stage, we should note that he has never actually collected developmental neuroimaging data (a key component of this proposal) nor has he done some of the more advanced statistical modeling that his research approach will require. Receiving the D-SPAN training would be an invaluable at this point in this career, and set him on an excellent career trajectory.

### William is an excellent candidate for the D-SPAN program. He has a uniquely strong analytic skill set, a tremendous work ethic, and will be an excellent researcher and mentor. Put plainly, he is one of the most talented individuals that I (Helion) have ever worked with. This statement is underscored by the diversity of awards that he has already received (for both research *and* mentoring) in his young career. He has unmatched potential, and I have no doubts that his work will inform our understanding of the developing brain. William is one of the most promising students that I have ever worked with is the ideal recipient for the D-SPAN fellowship. He has my absolute highest recommendation and full support.