**Editorial comments:**  
Changes to be made by the author(s) regarding the manuscript:

1. Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammar issues.

We have thoroughly read the manuscript and corrected any mistakes.

2. Please obtain explicit copyright permission to reuse any figures from a previous publication. Explicit permission can be expressed in the form of a letter from the editor or a link to the editorial policy that allows re-prints. Please upload this information as a .doc or .docx file to your Editorial Manager account. The Figure must be cited appropriately in the Figure Legend, i.e. “This figure has been modified from [citation].”

We have obtained formal permission to re-use the figures. This is indicated in the manuscript and information will be submitted with the manuscript.

3. Figures 2-4: Please define the error bars and asterisk symbols in the figure legend.

This has been updated as requested.

4. Please revise the title to be more concise and avoid the use of colon.

The title has been revised accordingly.

5. Keywords: Please provide at least 6 keywords or phrases.

We have added an additional keyword to bring the total to 6

6. JoVE cannot publish manuscripts containing commercial language. This includes trademark symbols (™), registered symbols (®), and company names before an instrument or reagent. Please remove all commercial language from your manuscript and use generic terms instead. All commercial products should be sufficiently referenced in the Table of Materials and Reagents. You may use the generic term followed by “(see table of materials)” to draw the readers’ attention to specific commercial names. Examples of commercial sounding language in your manuscript are: Biopac,

We have removed the word “Biopac” from the manuscript.

7. Please include an ethics statement before the numbered protocol steps, indicating that the protocol follows the guidelines of your institution’s human research ethics committee.  
A statement of ethical approval has been added.

8. Please revise the protocol to contain only action items that direct the reader to do something (e.g., “Do this,” “Ensure that,” etc.). The actions should be described in the imperative tense in complete sentences wherever possible. Avoid usage of phrases such as “could be,” “should be,” and “would be” throughout the Protocol. Any text that cannot be written in the imperative tense may be added as a “Note.” Please include all safety procedures and use of hoods, etc. However, notes should be used sparingly and actions should be described in the imperative tense wherever possible. Please move the discussion about the protocol to the

Discussion.

We have revised the protocol to include only action items and removed unwanted language as requested.

9. The Protocol should be made up almost entirely of discrete steps without large paragraphs of text between sections. Please simplify the Protocol so that individual steps contain only 2-3 actions per step and a maximum of 4 sentences per step. Use sub-steps as necessary. Please move the discussion about the protocol to the Discussion.

We have modified our protocol to include only discrete steps.

10. After you have made all the recommended changes to your protocol (listed above), please highlight 2.75 pages or less of the Protocol (including headings and spacing) that identifies the essential steps of the protocol for the video, i.e., the steps that should be visualized to tell the most cohesive story of the Protocol.

We have highlighted the essential steps of the protocol.

11. Please highlight complete sentences (not parts of sentences). Please ensure that the highlighted part of the step includes at least one action that is written in imperative tense.

We have highlighted complete sentences.

12. Please include all relevant details that are required to perform the step in the highlighting. For example: If step 2.5 is highlighted for filming and the details of how to perform the step are given in steps 2.5.1 and 2.5.2, then the sub-steps where the details are provided must be highlighted.  
We have included all relevant details.

13. Lines 116, 321, 330, etc.: Please note that manuscripts that are under review should not be listed.  
The manuscript has since been accepted and the reference is updated to denote this.

14. JoVE articles are focused on the methods and the protocol, thus the discussion should be similarly focused. Please revise the Discussion to explicitly cover the following in detail in 3-6 paragraphs with citations:  
a) Critical steps within the protocol  
b) Any modifications and troubleshooting of the technique  
c) Any limitations of the technique  
d) The significance with respect to existing methods  
e) Any future applications of the technique

We have modified our Discussion as requested.

15. References: Please do not abbreviate journal titles. If there are six or more authors, list the first author and then “et al.”.

We have updated our references accordingly.

16. Please ensure that the references appear as the following: [Lastname, F.I., LastName, F.I., LastName, F.I. Article Title. Source. Volume (Issue), FirstPage – LastPage (YEAR).] For more than 6 authors, list only the first author then et al. See the example below:  
Bedford, C.D., Harris, R.N., Howd, R.A., Goff, D.A., Koolpe, G.A. Quaternary salts of 2-[(hydroxyimino)methyl]imidazole. Journal of Medicinal Chemistry. 32 (2), 493-503 (1998).

We have updated our references according to the provided format.

17. Table of Materials: Please sort the items in alphabetical order according to the Name of Material/Equipment.

We have sorted the table as requested  
  
**Reviewers' comments:**  
  
  
  
**Reviewer #1:**  
Manuscript Summary:  
This manuscript presents a new method for assessing emotional responses to affective touch using facial electromyography (EMG). The authors present two studies that both show that facial EMG of the corrugator supercilii muscle is sensitive to touch at CT-optimal and non-optimal frequencies, and that touch at the CT-optimal frequency suppresses corrugator activity. The authors suggest this method may be more effective at measuring affective responses to touch than self-report measures in some populations. The manuscript is very well written, clear, and thorough, and describes a method that will be useful to researchers studying affective responses to touch. Suggestions for improvement of the manuscript are below; these are mostly minor points for clarity.  
  
Major Concerns:  
One important aspect of this manuscript is the relationship between self-report and electromyographic measures, as the authors suggest EMG may be a more usable measure of emotional reactivity in certain populations. It would strengthen the manuscript to spend more time describing the relationship between self-report and EMG measures in the results (from both study 1 and study 2), rather than just mentioning them in the legend for figure 3D.

We have expanded our discussion of the relationship between self-report and EMG in the discussion, as suggested by the reviewer.

Further, it's clear EMG may be useful for populations with difficulty verbalizing self-report measures, but are the authors suggesting it is a more sensitive measure of emotional reactivity? Or does it merely have broader potential applications than self report? What about it's translational potential; has it been used to assess affect in animal models?

We appreciate these important points brought forth by the reviewer. At this stage, we cannot say for certain that this measure is more sensitive or if it is assessing a distinct dimension of affective processing. However, we know from other studies that interventions such as drug administration [1] or stress exposure [2] can influence EMG responses independent of changes in self-report ratings. Thus, as a method, EMG may be useful in tapping into certain facets of affective processing that may not be accessible via self-report. The role of facial expressions in human (and animal) behavior has recently gained much interest (e.g. [3]) and we are interested in the potential translational opportunities it puts forth.

Minor Concerns:  
Abstract  
Excellent, concise abstract.  
  
Introduction  
Good description of the CT-afferent literature that is appropriately detailed. The background information on populations with dysregulated CT-afferent signaling could be moved to the discussion, as this method is being presented in healthy populations and that would be a future application of the protocol.

We appreciate the reviewer’s suggestion. Unfortunately, we have been asked to limit our discussion and are thus unable to move the section as requested.

A couple of sentences introducing the two experiments that validated the methods could be added here to improve the flow of the manuscript.

We have added this to the manuscript prior to the results section.  
  
Protocol:  
A little more clarity on the control conditions would be helpful. What is the wooden hand controlling for? The authors note it is to "control for responses simply elicited by motion," but it seems as though responses to videos of the wooden hand and palm are similar. What are we to make of that? Does that mean the wooden hand condition is unnecessary?

This is an interesting point raised by the reviewer. The inclusion of the non-social condition (e.g. wooden arm) was to control for the possibility that velocity-sensitive responses may simply reflect the low-level frequency or periodicity information encoded within the videos [4]. The palm trials were included because the palm putatively lacks CT afferents, but is often engaged in social interactions (e.g. shaking of hands). Thus, we included this condition to determine whether generally social stimuli (e.g. stimuli containing two or more people) could elicit responses similar to stimuli that specifically depicted touch to an area rich in CT afferents.

We find that only the videos of touch to the CT-rich forearm at CT-optimal and non-optimal velocities can elicit differential corrugator activation. In the palm and non-social conditions, there was no significant difference between CT-optimal and non-optimal touch velocities. However, all CT-optimal videos were rated as more pleasant than non-optimal. As such, EMG of the corrugator muscle appears to be specifically activated in response to the observation of touch that potentially activates CT afferents, even if other stimuli (e.g. touch to the palm) are rated as pleasant. Thus, we do believe that inclusion of all three types of touch stimuli are informative.

The authors note the experimenters might want to occlude the participant's arm from view; it should be explained why this might be done.

We have included the following statement: “Occlude view of the arm from the participant either using a curtain separator or goggles that occlude lateral vision to avoid influence of vision on tactile perception( e.g. [6])”

Results  
The sample sizes for each study should be reported in the results.

We apologize for this oversight; we have included a table that denotes task information and sample sizes. Specifically, 30 individuals were in Experiment 1 and 44 individuals in Experiment 2.   
  
Discussion  
It should be added to the discussion that the identity of the person doing the touch (romantic partner, friend, stranger) may influence affective responses.

This is an important point raised by the reviewer which we have now included in the discussion.  
  
  
**Reviewer #2:**  
Minor change  
- Please go through the text: Some of the sentences seem incomplete because (1) the words are in the wrong order and/or repeated or (2) the reference style.

We have now thoroughly proofread the manuscript to correct these errors.  
  
Major changes  
As this is an invited manuscript, because of its novel methodology:  
- Please do not refer to Experiment 1 and 2 from the "original paper(s)". This JoVE manuscript is original in itself (so it shouldn't matter that one experiment is still under review).

We have removed this wording from the manuscript

- Please reduce the Result section to only describing the methodology.

We have attempted to reduce the result section to include only the relevant information.

- Please reduce the Discussion of the results (findings), and increase the discussion of the methodology used (e.g. in relation to data validity and reliability, as data were collected in two ways - EMB and self-report).

We have made an effort to modify the discussion as requested.   
  
  
**Reviewer #3:**   
The manuscript describes a novel method to measure the affective component of CT-fiber activating touch, which the researchers replicated in two independent studies. The method described is of high scientific standard and quality, and I have no doubt that the protocol will be used a lot in the affective touch field. The protocol will help with the standardization of the affective touch application across studies and therefore it will increase comparability of studies. However, as of now, the manuscript lacks details in the method and results, which are necessary for a proper replication and understanding of the methods. I address these points in detail below.  
  
Some general questions and remarks:

\*Is it correct that you find similar effects in corrugator reactivity for the experienced and observed touch condition? If so, what is the purpose of the observed touch condition? Is it a control condition?

Yes, we do find similar findings across modalities. Previous studies [4] have reported that affective touch can elicit similar brain activation patterns, regardless of whether it is directly experienced or merely observed. Thus, we wanted to determine if similar consistencies across modalities existed in EMG responses. Accordingly, we found consistent differentiation between CT-optimal and non-optimal touch in both experienced and observed conditions. However, this only applied to the trials that were directed to hairy (arm) skin and not to the glabrous (palm) skin

Can you give an explanation why you find similarities between the 2 modalities? Does this imply that the corrugator (de)activation in the CT-optimal touch is not due to CT-fiber activation?  
We hypothesize that affective touch is not only driven by bottom-up activation of CT-afferents, but also involves top-down integration of information from multiple sensory modalities. This is described at length in our previous paper [7]. Unfortunately, since this paper is focused on methodology, we are precluded from discussing this interpretation within the manuscript itself, but we agree that it is an intriguing finding.

\*You describe the temporal specificity of the corrugator response and list this as an advantage compared to the self-reports. Can you provide an example/ application where this temporal specificity would be useful/ helpful?

Specifically within the context of the current manuscript, we see a lack of corrugator activity early on (e.g. initial 700 ms) but then a distinct difference between CT-optimal and non-optimal touch velocities. This alone suggests that EMG can detect changes on timescales that may not be readily available via self-report. Similarly, this specificity may be useful in response to dynamic stimuli that change (e.g. randomly or contingent on response) or to stimuli that are presented briefly.

\*You are comparing EMG activation between a CT-optimal and a CT-non optimal touch condition and find currogator activation during the CT-non optimal touch. The question for me is whether the CT-optimal "deactivation" of the currogator reflects a change in EMG signal or is similar to a non-activated currogator. I think this can be addressed either with additional analyses or a different control condition. My concern is that the effects are driven by the CT non-optimal touch, which would diminish the value of your method for research in clinical populations. Imagine that a clinical population is impaired in affective touch (= CT-optimal touch) processing and you want to measure corrugator activation to tap into this impairment. You probably will not see a difference in currogator activation, because the clinical population will not be impaired in the non-affective (CT non-optimal) touch processing.

This is a nice point made by the reviewer. Our response is two-fold. First, across all of our studies, we measure the mean EMG response during the stimulus (e.g. touch) compared to the immediately preceding 1sec baseline. This is due to the fact that, regardless of how well the sensors are applied/acquire data, there will always be background noise, as described in [8]. For instance, people rarely show totally zero activity in a given EMG site, as physiological arousal/tension, movement, and activation in nearby muscles can all influence the baseline level of EMG. Thus, the realistic goal is not zero baseline EMG, but instead is to achieve a representative physiological baseline for the task at hand. As such, we find that non-optimal touch *increases* corrugator activity above this baseline. However, CT-optimal touch *reduces* corrugator activity as compared to this background EMG level.

In addition, we have proposed previously [7] that non-optimal touch may elicit a negative response as indexed by an increase in corrugator activity. However, recruitment of CT-afferents attenuates this otherwise negative response. Thus, if an individual lacked CT-afferents, we would expect to see increased corrugator reactivity to all touch, regardless of velocity. In doing so, we could conclude that the ability of CT-afferents to mitigate the negative response elicited by touch is absent. This is supported by the finding that our fast non-optimal (30 cm/s) and slow non-optimal (0.3 cm/s) elicit similar increases in corrugator reactivity, but in both experiments, this is mitigated by recruitment of CT-afferents.

We have begun to use this methodology to address these issues in clinical adolescent populations. We do find marked differences between patients and controls in regards to EMG responses to touch (but no differences in self-report ratings); however this data is not ready for publication quite yet.

\*It would be helpful for the understanding of the protocol and the analyses if you would include a short paragraph at the end of your introduction with a brief summary of your study design (thus the different conditions, within- and between subject factors, dependent variables, …) and the purpose of the different aspects of your study design.

We have included a table that addresses this concern.

Please also clarify what the purpose of the intensity rating is.

The intensity rating is included to assess more discriminative features of touch. In general, increasing velocities are rated as more intense, while the affective quality (e.g. Pleasantness) shows a U-shaped curve (e.g.[9]).

\*I am missing details/ advice on participant instructions. Especially to what extend participants should know of the purpose of the study.

The participants were informed that the main purpose of the study was to investigate how sensory input could influence decision making and perceptions of various sensations. They were further told that the facial EMG electrodes would measure muscle and sweat activity throughout the study. At the start of each task, participants were instructed to think of how the touch makes them feel. We then provide more detailed information in a short “debriefing” held after the session ended. These issues are discussed in length in [8], which is also now mentioned in the discussion.  
  
There are some cases where your writing is a bit sloppy:

\*In multiple instances words are missing:  
o 2nd paragraph introduction, line 55: "with TOUCH velocities"  
o In 2.1.2 of the protocol (line 150): "such AS A visual analog scale"  
o In 2.2.1, line 169: "and non-optimal (….) TOUCH"  
o In the results section, 2nd paragraph (line 284): "slow non-optimal TOUCH …. fast non-optimal TOUCH"  
o In the discussion section, line 362: "between CT-optimal and non-optimal TOUCH becomes…"

\*In 2.2.2 (line 178) the parenthesis should be deleted.  
\*Please refer to the correct Figures in section 5.2, line 249.

\*In 3.2.2 (line 206) "to" should be deleted in "the electrodes to in order"

\*Please be consistent in how you call your tasks. Sometimes you call the experienced touch task a condition, and sometimes a task.

\*Ethics statement is missing

We have corrected or removed these inconsistencies from the manuscript.

Feedback on details from the manuscript, which will improve the ease of replicability of your method:

\*Section 1.1: can you advice on the minimum number of participants with a short explanation why?

We have included the following in the manuscript: “A post-hoc power analysis based on Experiment 1 suggests at least 22 individuals should be included to reach a similar effect size.”

\*Section 2. Stimuli and task construction: for researchers who want to use your touch method, I feel like this section would be easier to read if you´d structure this part differently. I suggest you make a paragraph where you describe the touch application and a different paragraph where you describe the task design in detail

We have made efforts to clarify these sections within the constraints of the protocol requirements (e.g. we were instructed by the editor not to discuss the task details within the protocol).

\*Section 2.1.1:

o Regarding "Velocities can be distinguished using tones of differing pitches that precede the stimulation cues": it sounds very hard to remember which tone corresponds to which velocity (I can imagine an alternative, where you could also use an audio recording saying "10 cm/s" before the stimulation cues). Could you make a more general statement out of this?

We appreciate the author’s comment. Since we only use two velocities, it was straightforward enough to distinguish between the anticipatory tones denoting the touch type. However, we have noted that readers are free to construct their own audio cues to their liking.

o Regarding "on an iPad or other device only in view of the experimenter": Great point! Could you add why this is important?

We have included the following statement: “Occlude view of the arm from the participant either using a curtain separator or goggles that occlude lateral vision to avoid influence of vision on tactile perception( e.g. [6])”

o Regarding "Stimuli should be of a consistent length": I find the use of the word "stimuli" confusing. A stimulus could also refer to the audio/ visual cues. I suggest you change the wording to "stimulation" or "touch duration" (or something more appropriate). Same for section 4.3.

We have clarified this throughout.

o Regarding "the experimenter should train prior to the session": do you mean prior to every session? Or prior to data collection in general?

We only foresee training to be required prior to the first session, though this is based on the judgement of the experimenter. We have stated this more clearly within the manuscript.

o Regarding "i.e. by brushing on a scale": great point, but it is unclear how you would exactly do that. Do you mean doing the movements on the scale, or just a single push? Could you elaborate a little more on this?

We have updated the manuscript to read: “During training, use a scale to ensure that touch is delivered at a consistent pressure. To do so, apply brush strokes to the scale in a similar manner as they would to the participant. The scale readout is then used to determine if the pressure changes throughout touch administration. For instance, a pressure of 0.4N would register as 40gram on the scale.”

\*Section 2.1.2: you write "participants should focus on a fixation cross or blank screen on the computer screen": can you please explain why this is important?

We have modified this section, but this statement refers to the need to achieve a task-relevant physiological baseline, as described above. Since we always compare the EMG response to the immediately preceding baseline, it is imperative that the baseline be free of potential contamination by responses elicited from other sensory stimuli.

\*Section 2.1.3:

o General remark: this part is confusing because it does not read as a protocol but rather like a method section. I am also missing information on total number of trials, number of trials per block, duration of trial, and number of velocity types. Because of this I am confused about the following statement "In Experiment 2, the participants were exposed to repeated tactile stimulation": in experiment 1 you didn´t do that?

We have clarified this section and removed the reference portion.

o Regarding "Stimuli presentation should be (pseudo)randomized to avoid order effects": can you add a reference where they find order effects? Or alternatively can you describe how order affects your dependent variables?  
We have added a section to the discussion section that highlight the potential influence of order effects.

\*Section 2.2.1: You describe the delivery of touch to a wooden arm. Would you recommend this also for future studies? Please explain. I have the same question for the whole observed touch task. Do you recommend its use in future studies? Why (I think the purpose of the observed touch experiment is not completely clear)?

We appreciate the reviewer’s concern and have attempted to clarify within the text. Specifically, we used the observed touch task to determine whether affective touch requires only “bottom up” activation of CT-afferents (e.g. the experienced condition) or if “top-down” contributions can also influence facial muscle activity in a similar manner. Based on [4], we know that information from these two modalities is indeed processed by shared neural resources. Moreover, [10] showed that people use different velocities when asked to stroke an artificial arm as compared to a human arm. Thus, we included this condition to determine if affective responses were shared across modalities and specific to social stimuli.

\*Section 3.1: Regarding "It is recommended to use EMG amplifiers": this is a weird formulation. Is it possible to record EMG without an amplifier?!

We apologize for the wording. We simply meant to imply that the hardware could be used to apply basic filtering steps, while software could be used to apply additional filtering and processing. We have rewritten this accordingly.

\*Section 3.2: a schematic overview of the exact placement of the electrodes would be helpful for other researchers to replicate the method.

We have included more thorough descriptions of electrode placement, as well as references that depict such placements. If the manuscript is accepted, it will be accompanied by a video that will include detailed information regarding sensor placement.

\*Section 4.1:

o Does it matter which arm is used for the touch? Please explain.

In the classical microneurography studies exploring CT afferents, most recordings were obtained from the left arm [11]. However, when using facial EMG, we would recommend touch be applied to the arm that is *not* being used to provide self-report ratings. Moving the arm back and forth (between the location for touch administration and to grab the mouse) could induce movement artifacts into the EMG recordings. We have included this suggestion in the protocol.

o A picture of the set-up might be helpful for the reproduction of the methods.

We have included a picture, as requested.

\*Section 4.3.:

o Does it matter what kind of brush is used? Please explain! Also explain why you use a brush instead of a hand, because in the introduction you write that CT-fibers are optimally activated with touch at skin temperature.  
We used a 75mm goat hair painter’s brush, as listed in the materials list. Previous studies [4] have shown that a stiff brush (e.g. horse hair) is overall rated as less pleasant (compared to goat hair), but the pleasantness ratings for CT-optimal and non-optimal touch do not differ across brush types.

We used a brush instead of hand in an attempt to standardize the touch application, e.g. reduce variability due to skin temperature, moisture, etc. While we agree that hand touch would be more ecologically valid, we wanted the ability to standardize the touch application as much as possible, as well as be able to compare to previous studies that have used a brush to administer touch (e.g. [9, 11]). Moreover, recent evidence suggests that participants do not differ in pleasantness ratings of touch by skin or satin [12], perhaps suggesting that we would perhaps find similar effects between touch via brush and hand. However, we agree that this is an important point and thus included it in the discussion.

o Who is applying the touch? Does it matter whether gender with participant is matched? Is the participant instructed on who is touching her?

This is an important point raised by the reviewers. The same experimenter applied the touch to all participants in a given study, thus we cannot say from our data alone whether this influences the outcome. However, other studies have found an effect of toucher gender [13], so we have included this potential issue within the discussion.

o Regarding "touch was applied to a 9cm section": is the size of the section important? Please explain  
We have modified this section to remove this wording.

\*Section 5: Could you please include a section with basic, general analysis steps regarding which conditions you compare and for what purpose? This helps with getting a general idea of what you can do with the tasks.  
We have included basic analysis steps in the description of the tasks (Table 1), as well as reported the main effects and interactions more clearly in the results section.

o Please add dependent variable. It is unclear what "mean activation" you are referring to.

We have clarified this to state that the mean activation refers to the mean amplitude during each touch stimulus as compared to the mean amplitude during the immediately preceding 1sec baseline for the given muscle.

o Please be more specific regarding stimulus types, i.e. name them here.

We have clarified this wording throughout.

o It is unclear what the baseline in your task is, or when it is measured. Please clarify in the section where you explain your tasks.

The baseline is the background EMG signal, e.g. in the absence of any stimulus. Regardless of the quality of the sensor application/recording, there will always be a baseline EMG level that may fluctuate over time. To account for this, a “response” is quantified as the mean EMG activity during the stimulus (e.g. 6 sec) compared to the immediately preceding 1 sec baseline. Thus, the values reported are always a change from the baseline/background.

\*Representative results section:

o General: If researchers want to use your method, I feel like it would be helpful for them to be able to compare their results with your results. Therefore could you please be more specific in your results section whether you report main effects, interactions, what kind of analysis you did (f.e. repeated measures Anova with which independent variables and which dependent variable). For this purpose, could you please also report the results of all the independent variables (if you haven´t already done this)? And could you also add somewhere how many participants you tested for the two experiments?

This information has been added to the manuscript in the appropriate locations.

o Paragraph 1: please clarify what "socially relevant trials" are

This wording has been removed from the manuscript.

o Paragraph 2: you describe that pleasantness ratings are related to corrugator reactivity. Could you add a correlation here?

Is a p-value missing on line 293 when describing the corrugator reactivity?

We appreciate the reviewer for point this out and have included this missing value.

\*Figures: please add a description of the error-bars  
We have updated the figure description to state that error bars represent the standard error of the mean.

o 3b: the size of the error bar is unclear in the CT non-optimal touch, because the y-axis only goes till -4. Please change so that other researchers who use your method can compare their results with yours.  
We have corrected this as requested.

o 3c and d: please also add a similar graph for the zygomatic activation, so that other researchers can compare their results with yours.  
We have added this as requested.

o 4a and b: very difficult to distinguish lines. Figure 4a and 4c show the same things, right? If yes, could you make a similar graph as in 4c for the zygomatic activation over time? And if 4a and 4c show the same results, I think 4a (and b if changed) are obsolete. The results are easier to understand from 4c.

We have modified our figures based on these requests.

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