### PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (http://bmjopen.bmj.com/site/about/resources/checklist.pdf) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

### ARTICLE DETAILS

TITLE (PROVISIONAL)	Willingness, Perceived Barriers and Motivators in Adopting Mobile Applications for Health-Related Interventions among Older Adults: A Scoping Review Protocol
AUTHORS	AHMAD, NURUL; Mat Ludin, Arimi Fitri; Shahar, Suzana; Mohd Noah, Shahrul; Mohd Tohit, Noorlaili

## VERSION 1 – REVIEW

REVIEWER	Martine Puts
	Lawrence S. Bloomberg Faculty of Nursing
	University of Toronto
	Toronto, Ontario
	Canada
REVIEW RETURNED	17-Oct-2019
GENERAL COMMENTS	Thank you for allowing me to review your scoping review protocol.
	In general it is well written but I have a few questions/concerns.
	The authors have used the Prisma P statement for reporting but there is actually a Prisma Scoping review statement for reporting and that one should be used.Please change that in the review. In addition, in both reporting statements it is mentioned that the search should be appended and it has not been appended so please add.
	Furthermore both in the abstract and methods it is mentioned that the Arksey and O'Malley framework will be used and it is described as having 5 steps but it actually has 6 steps with the last step being consultation. So please clarify why this will not be done and include that in the limitation section.
	In the introduction only Maleysian stats are included but it would be good to include some more stats from various parts of the world. And in terms of the review it is mentioned mobile phones but do you mean smart phones ? or could it be SMS interventions on the
	mobile phone be eligible?
	Why in the search was the limit of the last 10 years applied?
	And for the search why will CINAHL not included as database as it is allied health literature?
	Please clarify if all the abstracts will be screened by one or 2 reviewers?

	You also may want to consider using Covidence software for your
	review instead of Excel as it will help facilitate the review.
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REVIEWER	Hanna Augustsson
	Karolinska Institutet, Sweden
REVIEW RETURNED	04-Nov-2019
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GENERAL COMMENTS	The study protocol outlines a scoping review focusing on older adults' willingness to use mobile phones/applications to manage and monitor their own health and perceived barriers and facilitators for their use. This is an interesting and important topic. Below, I have made some suggestions for how the protocol and the review may be improved and raised some questions that need to be
	<ul> <li>clarified.</li> <li>1. Page 7, line 6. Please add a reference for this section.</li> <li>2. In the background the authors focus mainly on mobile phone use etc. in Malaysia. If the focus of the review is international/global this should also be visible in the background text and the references used.</li> <li>3. Can you please put your scoping review in relation to other reviews conducted on the topic? The background should highlight what knowledge is missing and what the proposed review will add. This will clarify your contribution to the field.</li> <li>4. Your research questions all focus on the use of mobile applications to monitor health conditions. However, you later, e.g. on p 11, line 13, say that your overarching research question refer both to mobile phone usage to manage and monitor health</li> </ul>
	<ul> <li>conditions. Can you please clarify what the aims/research questions are and make sure that this is consistent all through the text.</li> <li>5. You may want to add the term "acceptability" to your perspective category of search terms as many eHealth studies use this term.</li> <li>6. Peer-reviewed primary research is one of the listed eligibility criteria but on p. 12 line 1-13 you state that you will search grey literature to identify studies, reports and conference abstracts of relevance to the review. Please clarify what type of publications that will be included in the review.</li> <li>7. The focus of the studies is lacking in the list of eligibility criteria, i.e. studies addressing older adults' perspectives with regard to willingness and perceived barriers/facilitators toward the use of mobile phones/applications to manage and monitor health.</li> <li>8. You may want to consider to test the inclusion and exclusion criteria to ensure consensus on included citations before independently assessing the articles, in addition to screening a</li> </ul>
	<ul> <li>sample of articles. This will help you to detect and resolve potential disagreements in advance.</li> <li>9. P.16, line 30. Clarify that is barriers and facilitators towards the use of mobile phones/applications to manage and monitor health conditions and not toward mobile phones in general.</li> <li>10. I believe that the protocol would benefit from a language check. The study protocol outlines a scoping review focusing on older adults' willingness to use mobile phones/applications to manage and monitor their own health and perceived barriers and facilitators for their use. This is an interesting and important topic. Below, I have made some suggestions for how the protocol and the review may be improved and raised some questions that need to be clarified.</li> <li>1. Page 7, line 6. Please add a reference for this section.</li> </ul>

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	use etc. in Malaysia. If the focus of the review is
	international/global this should also be visible in the background text and the references used.
	3. Can you please put your scoping review in relation to other
	reviews conducted on the topic? The background should highlight
	what knowledge is missing and what the proposed review will add.
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	applications to monitor health conditions. However, you later, e.g.
	on p 11, line 13, say that your overarching research question refer
	both to mobile phone usage to manage and monitor health
	conditions. Can you please clarify what the aims/research
	questions are and make sure that this is consistent all through the
	text.
	5. You may want to add the term "acceptability" to your
	perspective category of search terms as many eHealth studies use this term.
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	literature to identify studies, reports and conference abstracts of
	relevance to the review. Please clarify what type of publications
	that will be included in the review.
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	i.e. studies addressing older adults' perspectives with regard to
	willingness and perceived barriers/facilitators toward the use of
	mobile phones/applications to manage and monitor health.
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	criteria to ensure consensus on included citations before
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	use of mobile phones/applications to manage and monitor health
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	older adults' willingness to use mobile phones/applications to
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	the review may be improved and raised some questions that need
	to be clarified.
	1. Page 7, line 6. Please add a reference for this section.
	2. In the background the authors focus mainly on mobile phone
	use etc. in Malaysia. If the focus of the review is
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	reviews conducted on the topic? The background should highlight
	what knowledge is missing and what the proposed review will add.
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	on p 11, line 13, say that your overarching research question refer
	both to mobile phone usage to manage and monitor health
	conditions. Can you please clarify what the aims/research
	questions are and make sure that this is consistent all through the
	text.

<ul> <li>relevance to the review. Please clarify what type of publications that will be included in the review.</li> <li>7. The focus of the studies is lacking in the list of eligibility criteria, i.e. studies addressing older adults' perspectives with regard to willingness and perceived barriers/facilitators toward the use of mobile phones/applications to manage and monitor health.</li> <li>8. You may want to consider to test the inclusion and exclusion criteria to ensure consensus on included citations before independently assessing the articles, in addition to screening a sample of articles. This will help you to detect and resolve potential disagreements in advance.</li> <li>9. P.16, line 30. Clarify that is barriers and facilitators towards the use of mobile phones/applications to manage and monitor health conditions and not toward mobile phones in general.</li> <li>10. I believe that the protocol would benefit from a language check.</li> </ul>
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# VERSION 1 – AUTHOR RESPONSE

Reviewer 1 comments	Original	Corrections	Page
The authors have used the Prisma P statement for reporting but there is actually a Prisma Scoping review statement for reporting and that one should be used. Please change that in the review. In addition, in both reporting statements it is mentioned that the search should be appended and it has not been appended so please add.	page 10	PRISMA-P checklist has been removed and we have completed the PRISMA-ScR checklist accordingly. The completed PRISMA-ScR checklist is now being attached as online supplementary 1.	6
Both in the abstract and methods it is mentioned that the Arksey and O'Malley framework will be used and it is described as having 5 steps but it actually has 6 steps with the last step being consultation. So please clarify why this will not be done and include that in the limitation section.	3 and 9	We have include step 6 (consultation with stakeholders) in the method section and edited the abstract section accordingly as follows: <u>Abstract section:</u> Finally, engagement with relevant stakeholders will be carried out to gain more insights into our data from different perspectives. <u>Method section:</u>	2
		<u>Stage 6: Consultation with stakeholders</u> This sixth stage of Arksey and O'Malley's framework (34) is an optional component in conducting scoping reviews. We aim to	

In the introduction only Malaysian	6-9	engage relevant stakeholders to gain more insights into our data from different perspectives. A detailed design of consultation process will be created after stage five of the methodology (collating, summarizing and reporting the results) has completed. We have added some statistics and other	
stats are included but it would be good to include some more stats from		studies from various part of the world to strengthen our points/view.	
various parts of the world.		<ul> <li>In the introduction section:</li> <li>Today, there are 703 million people aged 65 years or over in the world. This number is projected to double to 1.5 billion in 2050 with the proportion of one in six people in the world will be aged 65 years or over.</li> <li>Although older adults may be seen as technological laggards, the internet usage among this subpopulation has been reported to increase from year to year (15). For instance, in the UK, the internet usage among older adults aged 65 to 74 group has increased gradually over the last eight years, with 52% in 2011 to 83% in 2019 (16). To add, the trend of smartphone ownership reported to grow rapidly across the globe (17).</li> </ul>	4
And in terms of the review it is	Througho	We have noticed this inconsistency and we	Throughou
mentioned mobile phones but do you mean smart phones ? or could it be	ut the manuscri	have edited this part accordingly. This study will focuses on the mobile application on	t the manuscript
SMS interventions on the mobile phone be eligible?	pt	smartphone use to monitor and manage health among older adults. In the Introduction section:	
		Therefore, this review aims to identify older adults' willingness, perceived barriers and motivators towards the use of mobile applications to monitor and manage their health.	5
Why in the search was the limit of the last 10 years applied?	14	In the method section: Studies that have been published from January 2009 to April 2019 were selected to be included in this study due to an immense growth reported in the number of mobile health applications download in the past 10 years with growth rate of more than 7% each year (38).	10

And for the search why will CINAHL not included as database as it is allied health literature?	11	We may have overlooked this and included CINAHL as one of the electronic databases in the search strategy.	
		In the method section: <u>Stage 2: Identifying relevant studies</u> The following electronic databases have been selected: (1) PubMed; (2) Excerpta Medica Database (EMBASE); (3) Cumulative Index to Nursing and Allied Health Literature (CINAHL); (4) COCHRANE Library; (5) Google Scholar; and (6) ScienceDirect.	7
Please clarify if all the abstracts will be screened by one or 2 reviewers?	15	We have decided to have two reviewers to run the screening procedure.	
		In the method section: <u>Stage 3: Study Selection</u> In the first stage, two reviewers will independently screen the titles and abstract of the articles where during this stage, the following decisions will be undertaken: (1) for any article that both reviewers agree to include, the article will proceed onto the second stage of screening process where the article will be read in full by each reviewer; (2) for any article that both reviewers agree to exclude, the article will not be read in full and excluded from the study; (3) for any article that did not achieved agreement between both reviewer ie. whether to include or exclude, the article will proceed onto the second stage of screening process to be read in full by each reviewer before final decision is made.	9
You also may want to consider using Covidence software for your review instead of Excel as it will help facilitate the review.	16	We appreciate the suggestion and we have decided to use Covidence software to organize and track data.	
		In the method section: Stage 4: Charting the data A combination of EndNote X9 and Covidence software will be used to organize and track relevant data.	10
Reviewer 2 comments	Original	Corrections	Page
	page		Number

Page 7, line 6. Please add a	7	We've done a major reconstruction in the	4-5
reference for this section.	'	introduction section and the sentence has	40
		been removed.	
In the background the authors focus	6-9	We have added some statistics and studies	
mainly on mobile phone use etc. in		from various part of the world to strengthen	
Malaysia. If the focus of the review is		our study.	
international/global this should also			
be visible in the background text and		In the introduction section:	
the references used.		• The world's older population continues to	4
		grow at a rapid pace. Today, there were	
		703 million people aged 65 years or over	
		in the world (1). This number is projected to double to 1.5 billion in 2050 with the	
		proportion of one in six people in the	
		world will be aged 65 years or over (1).	
		<ul> <li>In the case of Malaysia's population, this</li> </ul>	
		subpopulation has increased gradually	
		since the 1970s and expected to be	
		tripled from 2.0 million today to more than	
		6.0 million by 2040 (2, 3).	
		Although older adults may be seen as	
		technological laggards, the internet usage	
		among this subpopulation has been	
		reported to increase from year to year	
		(15). For instance, in the UK, the internet	
		usage among older adults aged 65 to 74 group has increased gradually over the	
		last eight years, with 52% in 2011 to 83%	
		in 2019 (16). To add, the trend of	
		smartphone ownership reported to grow	
		rapidly across the globe (17).	
Can you please put your scoping	6-9	We have added relevant studies and highlight	
review in relation to other reviews		what knowledge is missing/limited in the last	
conducted on the topic? The		part of the introduction section.	
background should highlight what			
knowledge is missing and what the		In the introduction section:	5
proposed review will add. This will		The steady growth of older adult population	
clarify your contribution to the field.		combined with rising trend in technology uptake within this subpopulation suggest	
		mHealth applications may represent a novel	
		way to improve the health of older adults as	
		well as to reduce healthcare cost. Despite the	
		numerous benefits of mHealth applications	
		(30-33), relatively little is known about	
		whether older adults perceive that these apps	
		confer such benefits. Their perspectives	
		towards the use of mobile applications for	
		health-related purposes have also been little	
		studied. Therefore, this review aims to identify	
		older adults' willingness, perceived barriers and motivators towards the use of mobile	
	1		

		applications to monitor and manage their health.	
Your research questions all focus on the use of mobile applications to monitor health conditions. However, you later, e.g. on p 11, line 13, say that your overarching research question refer both to mobile phone usage to manage and monitor health conditions. Can you please clarify what the aims/research questions are and make sure that this is consistent all through the text.	11	We have noticed this inconsistency and we have edited this part accordingly. This study will focuses on the mobile application use to monitor and manage health among older adults. <u>In the method section:</u> <u>Stage 1: Identifying the research question.</u> We have identified one overarching research question to guide our systematic search strategy and reporting of results: 'What is known about the perspectives in adopting of mobile applications for health-related interventions among older adults?'.	Throughou t the manuscript 6
You may want to add the term "acceptability" to your perspective category of search terms as many eHealth studies use this term.	13	Thank you for the suggestion, we have now added the term "acceptability" to our perspective category in the search terms. <u>In the method section:</u> <u>Stage 2: Identifying relevant studies</u> Search terms from key words, subject heading and synonyms such as mobile application*, mobile app*, mhealth, mobile health, mobile health, telehealth, mobile technolog*, older adult*, elder*, ageing population, older population, aging, geriatric, perspective, view, attitude, mindset, willingness, readiness, acceptability, barrier, limitation, difficulty, restriction, drawback, facilitate*, motivate*, promote*, help, ease, aid will be generated by the research team members in order to capture any potential resources from the databases.	7 and 8
Peer-reviewed primary research is one of the listed eligibility criteria but on p. 12 line 1-13 you state that you will search grey literature to identify studies, reports and conference abstracts of relevance to the review. Please clarify what type of publications that will be included in the review.	12	We have noticed this confusion and we have clarify what type of publications that will be included in the review. <u>In the method section:</u> <u>Stage 2: Identifying relevant studies</u> The search strategy was collaboratively developed by our research team. Our literature search is open, including both peer- reviewed literature as well as grey literature ie. evidence not published in peer-reviewed publications and from the ten pages in the Google search engine. <u>Stage 3: Study Selection</u>	7

		Eligibility criteria	9
		<ul> <li>An article will be included when it:</li> <li>is either a peer-reviewed literature or grey literature</li> </ul>	9
The focus of the studies is lacking in the list of eligibility criteria, i.e. studies addressing older adults' perspectives with regard to willingness and	14	We have edited this section accordingly as follows: In the method section:	9
perceived barriers/facilitators toward the use of mobile phones/applications to manage and monitor health.		<ul> <li><u>Stage 3: Study Selection</u></li> <li><i>Eligibility criteria</i></li> <li>An article will be included when it: <ul> <li>describes or reports older adults' perspectives either their willingness or barriers or motivators towards the use of mobile applications in monitoring and managing their health condition;</li> </ul> </li> </ul>	
You may want to consider to test the inclusion and exclusion criteria to ensure consensus on included citations before independently assessing the articles, in addition to screening a sample of articles. This will help you to detect and resolve potential disagreements in advance.	15	We have edited this accordingly as follows: <u>In the method section:</u> <u>Stage 2: Identifying relevant studies</u> In order to determine the relevance of the citations and to resolve any potential disagreements, the research team will meet to refine the study inclusion and exclusion criteria prior to assessing the articles independently.	7
P.16, line 30. Clarify that is barriers and facilitators towards the use of mobile phones/applications to manage and monitor health conditions and not toward mobile phones in general.	16	We have noticed this inconsistency and we have edited this part accordingly. This study will focuses on the mobile application use to monitor and manage health among older adults.	
		In the method section: Stage 4: Charting the data For each article, we are going to extract the following data; (1)characteristics of the study population, (2) settings, (3) characteristics of the mobile application used or tested, (4) type of outcome assessed (ie. older adults' perspectives; their willingness, barriers and motivators towards the use of mobile applications to monitor and manage their health).	10

I believe that the protocol would	Througho	We have performed language check with an	Throughou
benefit from a language check.	ut the	English-speaking colleague.	t the
	manuscri pt		manuscript

### **VERSION 2 – REVIEW**

REVIEWER	Martine Puts
	Lawrence S. Bloomberg Faculty of Nursing
	University of Toronto
	Canada
REVIEW RETURNED	16-Dec-2019
GENERAL COMMENTS	The scoping review protocol is well written but there are some things that need clarification.
	For the abstract instead of saying numerous databases please add which ones will be searched.
	Please add the review question(s) at the end of your introduction, it is not clear what they are. For the scoping review methods, the Arksey and O'Malley's framework is mentioned, but there are many advancements done
	to this framework so please review those. And I wonder as the apps are interventions, why use a scoping review methodology, why not use systematic review methodology?
	In the introduction page 5 line 38 you refer to there are many studies for older adults but no references are provided, please add.
	In the introduction it is mentioned you will examine barriers etc but how will you take into account effectiveness of the apps? If the app is not effective in reaching intended clinical outcome it is irrelevant what the barriers are?
	And for the apps as apps have been developed for many different diseases, such as mood disorders and cardiovascular monitoring, will you analyse by chronic condition? The barriers for self- monitoring maybe very different than an app to engage in games for mood or cognition.
	For the inclusion criteria is available in full text, this i think should be omitted as you only search papers published in the past 10 years so you should be able to get all . and for the inclusion criteria; is a peer-reviewed literature or grey literature; do you mean used a certain study design to evaluate the design? E.g. experimental design with control group? and how for grey literature will you decide that? peer reviewed literature is not a study design so please clarify and rewrite.
	for the data abstraction, there seems to be very little data collected to help determine the quality of the included study. The enhanced framework is advocating for quality assessments, please clarify if you will do a quality assessment for included studies.
	For the 6th step, please clarify what stakeholders you will consult?

REVIEWER	Hanna Augustsson Karolinska Institutet, Sweden		
REVIEW RETURNED	05-Jan-2020		
GENERAL COMMENTS	I am happy with the authors amendments to the protocol and look		
	forward to reading the final scoping review.		

# **VERSION 2 – AUTHOR RESPONSE**

Items	Reviewer 1 comments	Original page	Corrections	Page Number
1	For the abstract, instead of saying numerous databases please add which ones will be searched.		We have edited this accordingly as follows:	
		2	The search strategy will involve electronic databases including PubMed, EMBASE, CINAHL, COCHRANE Library, Google Scholar, and ScienceDirect, in addition to grey literature sources and hand-searching of reference lists.	2
2	Please add the review question(s) at the end of your introduction, it is not clear what they are.		We have edited this accordingly as follows:	
		5	Therefore, this review aims to identify what is known about the perspectives in adopting mobile applications for health-related interventions among older adults. The specific research questions are:	5
			<ol> <li>What is the level of willingness among older adults in using mobile applications to monitor and manage their health conditions?</li> </ol>	
			2. What are the existing barriers among older adults in using mobile applications to monitor and manage their health conditions?	
			<ol> <li>What motivates older adults to use mobile applications to</li> </ol>	

			monitor and manage their health conditions?	
3	For the scoping review methods, the Arksey and O'Malley's framework is mentioned, but there are many advancements done to this framework so please review those.	6	We have reviewed this and add references accordingly: This study will adopt Arksey and O'Malley's (35) framework for scoping reviews as the foundation and more recent advancements to the methodology (36, 37) as well as the updated framework by The Joanna Briggs Institute (38).	6
4	And I wonder as the apps are interventions, why use a scoping review methodology, why not use systematic review methodology?	Through out the manuscr ipt	We aim to gather backgrounds around older adults' perspectives towards the use of mobile applications to manage and monitor health condition. For your acknowledgement, this is our initial plan prior to developing our own mobile application to fit the purpose to manage and monitor health among older adults. We are planning to gather as much information as we could about their perspectives to help further guide us in developing the mobile app. Having said that, we are not anticipated to explore the effectiveness of such apps in the literature.	Through out the manuscr ipt
5	In the introduction page 5 line 38 you refer to there are many studies for older adults but no references are provided, please add.	5	We have already provide the reference for this. Despite the numerous benefits of mHealth applications (30-33), relatively little is known about whether older adults perceive that these apps confer such benefits.	5
6	In the introduction it is mentioned you will examine	5	We aim to gather backgrounds around older adults' perspectives towards the	5

7	In reaching intended clinical outcome it is irrelevant what the barriers are?	Through	plan prior to developing our own mobile application to fit the purpose to manage and monitor health among older adults. We are planning to gather as much information as we could about their perspectives to help further guide us in developing the mobile app. Having said that, we are not anticipated to explore the effectiveness of such apps in the literature.	Through
	been developed for many different diseases, such as mood disorders and cardiovascular monitoring, will you analyse by chronic condition? The barriers for self-monitoring maybe very different than an app to engage in games for mood or cognition.	out the manuscr ipt	<ul> <li>analyse and divide the results into (1)</li> <li>Apps that focus on chronic disease management and, (2) Apps that focus on prevention of chronic diseases ie. to promote good health.</li> <li>We will produce a mobile app that will guide the elderly in diabetes management as well as promoting exercise for better cognition.</li> </ul>	out the manuscr ipt
8	For the inclusion criteria is available in full text, this i think should be omitted as you only search papers published in the past 10 years so you should be able to get all .	10	We have edited this accordingly as follows: <u>In the method section (Stage 3: Study</u> <u>Selection)</u> We have removed the forth bullet points (is available in full text;)	10

9	and for the inclusion criteria; is a peer-reviewed literature or grey literature; do you mean used a certain study design to evaluate the design? E.g. experimental design with control group? and how for grey literature will you decide that? peer reviewed literature is not a study design so please clarify and rewrite.	10	We will include all the peer reviewed literature for any study design. As this is a scoping review, we are not going to appraise individual study.	10
10	for the data abstraction, there seems to be very little data collected to help determine the quality of the included study. The enhanced framework is advocating for quality assessments, please clarify if you will do a quality assessment for included studies.	10	We are not going to appraise and conduct quality assessment. This method is in accordance to one recent study publish in BMJ Open by Appoh L. et al. (Barriers to access of healthcare services by the immigrant population in Scandinavia: a scoping review protocol.)	10
11	For the 6th step, please clarify what stakeholders you will consult?	11	We have edited this as follows: We aim to engage with relevant stakeholders such as geriatricians, family medicine doctors, mobile applications developers, dietitians, psychologists and/or clinical psychologists to gain more insights into our data from different perspectives.	11

# **VERSION 3 – REVIEW**

REVIEWER	Martine Puts PhD RN Lawrence S. Bloomberg Faculty of Nursing University of Toronto Toronto, ON Canada	
REVIEW RETURNED	16-Feb-2020	
GENERAL COMMENTS	All comments are addressed.	