More than 5 million individuals in the United States have heart failure and this number is predicted to increase to 8 million by 2030 (Go et al., 2014). Heart failure can negatively impact quality of life due to debilitating symptoms such as fatigue, fluid retention, and shortness of breath (Heart Failure Society of America, 2010). One in nine deaths documented on death certificates is from heart failure, and occurs within 5 years of diagnosis in approximately 50% of individuals (Go et al., 2014). Heart failure is also costly, accounting for approximately $30.7 million in 2012 (Go et al., 2014).

Management of heart failure includes taking medications, regular exercise, stress reduction, keeping follow-up appointments, and sodium and fluid restrictions (Heart Failure Society of America, 2010). Medications are essential in heart failure treatment because they lessen symptoms, decrease hospital admissions, and delay mortality (van der Wal & Jaarsma, 2008). Despite the importance of medications, approximately 50% of the heart failure population does not adhere to medication regimens (Zhang, Wu, Fendrick, & Baicker, 2013).

Adherence is defined as “the extent to which a person’s behaviour-taking medica-

ABSTRACT
Medication adherence is crucial in patients with heart failure; however, the rate of medication nonadherence in the heart failure population is 50%, making it a significant problem. The purpose of the current review was to summarize intervention studies designed to improve medication adherence in older adults with heart failure. A search was conducted to locate randomized controlled trials or quasi-experimental studies that tested interventions to improve medication adherence in patients 45 or older with heart failure. Five of eight studies (63%) showed a statistically significant improvement in medication adherence in intervention groups. Five of these six studies used a combination of educational, behavioral, and affective interventions, and focused on medication adherence alone versus multiple health behaviors. Interventions using combined approaches and focusing only on medication adherence show the most promise for future studies. [Journal of Gerontological Nursing, 43(10), 37-45.]

Angela M. Andrews, MSN, RN; Cynthia L. Russell, PhD, RN, FAAN; and An-Lin Cheng, PhD
tion, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider” (Sabaté, 2003, p. 18). Nonadherence to medication or dietary regimens causes more than one third of hospital admissions in patients with heart failure (Bosworth, Oddone, & Weinberger, 2006). One study found that individuals with heart failure who were adherent to medications had a $8,881 reduction in annual medical spending (Roe-buck, Liberman, Gemmill-Toyama, & Brennan, 2011).

Despite substantial research focused on improving medication adherence, nonadherence remains a significant problem (Sabaté, 2003). Interventions can increase medication adherence but there is still a need for additional research to improve intervention effectiveness (Conn et al., 2009; Sabaté, 2003).

Heart failure is common in older adults (Alagiakrishnan, Banach, Jones, Ahmed, & Aronow, 2013), and those with heart failure are prescribed complex medication regimens, making adherence particularly challenging in this population (Griffiths, Johnson, Piper, & Langdon, 2004). The World Health Organization proposes five factors affect medication adherence: patient-related barriers, therapy-related barriers, condition-related barriers, social/economic factors, and health system barriers (Sabaté, 2003). Heart failure leads to debilitating symptoms, and medications, such as diuretics, have significant side effects that cause this population to face different challenges to adherence than others (Heart Failure Society of America, 2010). Patients with heart failure believe medications decrease symptoms and may stop taking their medications if they do not lessen symptoms (Granger, 2004). Additional barriers to medication adherence that older adults face, making them different than other age groups, include cognitive level, forgetfulness, and complexity of medication regimens (Gellad, Grenard, & Marcum, 2011; Siabani, Leeder, & Davidson, 2013). It is crucial to consider these factors when formulating interventions to improve adherence.

The purpose of the current review was to summarize interventions designed to improve medication adherence in older adults with heart failure. To the current authors’ knowledge, no report has systematically reviewed interventions to improve medication adherence in this population. The review included intervention studies with only older adult populations, making it different from previous reviews (Molloy, O’Carroll, Witham, & McMurdo, 2012). Older adults have different challenges to adherence, such as complex medication regimens, possible financial issues due to retirement, and possible need for help with medication taking, making it crucial to study this population separately (Yap, Thirumoorthy, & Kwan, 2016). By identifying promising interventions, knowledge can guide future research and practice. Improving medication adherence in the growing older adult population can have a significant impact on health (Sabaté, 2003).

METHOD
A systematic review method was used following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to summarize the results of multiple studies exploring the effectiveness of interventions to improve medication adherence in older adults with heart failure. PRISMA guidelines comprise a 27-item checklist and flow diagram depicting records identified and included and excluded studies. The guidelines were established to improve transparency and clarity of systematic reviews and meta-analyses (Moher, Liberati, Tetzlaff, & Altman, 2009).

Search Strategies
A comprehensive search was completed with assistance from a health sciences research librarian. Databases searched included PubMed (1940-2015), CINAHL (1982-2015), PsycINFO (1806-2015), and Embase (1980-2015). There was no date restriction; articles from the database foundation date to July 2015 were included. Reference lists were also searched to identify additional studies. Keywords included: adherence, compliance, persistence, concordance, nonadherence, non-adherence, non-compliance, non-compliance, heart failure, cardiac failure, heart decompensation, myocardial failure, cardiomyopathy, pharmaceutical, prescription, medication, medicine, drugs, intervention, random, control, clinical, and trial.

Eligibility Criteria
Only higher-level evidence designs of randomized controlled trials (RCTs) or quasi-experimental designs were included. Inclusion criteria were: intervention study, medication adherence measured as the primary or secondary outcome, inclusion criteria of diagnosis of heart failure, and participants 45 or older. Previous research of older adults with heart failure used a wide range of age criteria to define older adults. Some studies defined older adults as 60 or older (Alagiakrishnan et al., 2013), whereas others defined them as ages 45 to 50 or older (Dickson et al., 2014; Goldstein et al., 2014; Hope, Wu, Tu, Young, & Murray, 2004; Morrow et al., 2005). Because age at diagnosis of heart failure is decreasing (Go et al., 2014), age 45 or older was selected for the current systematic review for the findings to be more generalizable.

Studies were excluded if they were not published in English or were dissertations or unpublished manuscripts.

Trial Selection
The initial search yielded 5,204 articles. After duplicates were removed, 4,275 articles remained. Articles were then screened by title...
and removed if the title included a different disease than heart failure; was a systematic review, literature review, or meta-analysis; or focused on other adherence behaviors. This screening resulted in 337 articles remaining to be screened for eligibility. Eight studies met criteria for inclusion. The trial selection PRISMA chart is shown in the Figure.

**Data Extraction**

Data were extracted from the eight selected studies by the first author (A.M.A.) and verified by a coauthor (C.L.R.). Data extraction included author and year, purpose/design/theory, sample/setting, intervention description, measures/outcomes, results, strengths/limitations, and elements for quality assessment. The summarized data are shown in Table 1. A completed table can be obtained by contacting the first author (A.M.A.).

**Quality Assessment**

Study quality was assessed using the Downs and Black (1998) scoring tool, which was formulated for use in epidemiology studies but is useful for health science research. The tool comprises 27 items that consider reporting, external and internal validity, selection bias, and sample power. This tool was found to have high internal consistency (Kuder–Richardson test = 0.89), good criterion validity, and good test–retest (0.88) and interrater reliability (0.75) (Downs & Black, 1998). Quality scoring was completed by two authors (A.M.A., C.L.R.) and compared for differences. Differences were resolved by discussion and resulted in no unresolved quality scoring disagreements. Results of quality scoring are shown in Table 2.

**RESULTS**

Of eight included studies, four were RCTs (Fulmer et al., 1999; Goodyer, Miskelly, & Milligan, 1995; Murray et al., 2007; Rich, Gray, Beckham, Wittenberg, & Luther, 1996), three were pilot RCTs (Barnason, Zimmerman, Hertzog, & Schulz, 2010; Barnason et al., 2003; Varma, McElnay, Hughes, Pasmmore, & Varma, 1999), and one used a quasi-experimental design without a control group (Goldstein et al., 2014). Quality scores ranged from 10 to 26, with an average score of 17. Quality scoring results are listed in Table 2. Study publication years ranged from 1995-2014 and sample sizes ranged from 35 (Barnason et al., 2003) to 314 (Murray et al., 2007) participants. Mean age of participants ranged from 62 (Murray et al., 2007) to 84.5 (Goodyer et al., 1995). Only one study attempted to include only nonadherent patients (Barnason et al., 2010). The studies were conducted in the United States (n = 6) (Barnason et al., 2010; Barnason et al., 2003; Fulmer et al., 1999; Goldstein et al., 2014; Murray et al., 2007; Rich et al., 1996), Northern Ireland (n = 1) (Varma et al., 1999), and the United Kingdom (n = 1) (Goodyer et al., 1995).

Interventionists included pharmacists (Goodyer et al., 1995; Murray et al., 2007; Rich et al., 1996; Varma et al., 1999), RNs (Barnason et al., 2010; Barnason et al., 2003; Rich et al., 1996), research assistants (Fulmer et al., 1999; Goldstein et al., 2014), and dietitians and social workers (Rich et al., 1996). Intervention duration ranged from 2 weeks (Barnason et al., 2010) to 12 months (Varma et al., 1999). Participants were contacted one time (Goldstein et al., 2014; Varma et al., 1999), twice (Barnason et al., 2010; Rich et al., 1996), daily for 6 weeks (Barnason et al., 2003; Fulmer et al., 1999), every 2 weeks for 3 months (Goodyer et al., 1995), and every 2 months for 1 year (Murray et al., 2007).

Only two studies used a theory-driven intervention (i.e., Bandura’s [2004] social cognitive theory) (Barnason et al., 2010; Barnason et al., 2003), in which interacting influences shaped new behaviors including personal factors and the physical and social environment. An assumption of this theory is that behaviors occur if an individual has the attitude and ability to perform a behavior and has outcome expectations (Bandura, 2004). Only one of these two studies had a statistically significant...
<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Design</th>
<th>Sample (N)/ Attrition (%)</th>
<th>Intervention/ Interventionist/ Duration</th>
<th>Adherence Measurement</th>
<th>Adherence Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnason, Zimmerman, Hertzog, &amp; Schulz (2010)</td>
<td>Pilot randomized controlled trial (RCT)</td>
<td>40/5</td>
<td>Education and counseling modules tailored to patient/nurse/2 to 3 weeks post-hospitalization</td>
<td>Brief Medication Questionnaire</td>
<td>Intervention group had higher levels of medication adherence (p &lt; 0.001)</td>
</tr>
<tr>
<td>Barnason et al. (2003)</td>
<td>Pilot RCT</td>
<td>35/0</td>
<td>Home communication intervention device (assess symptoms, risk factor modification, self-care education, positive reinforcement)/Health Buddy® and nurse/6 weeks</td>
<td>Cardiovascular Risk Factor Modification Adherence</td>
<td>No statistically significant differences between groups</td>
</tr>
<tr>
<td>Fulmer et al. (1999)</td>
<td>RCT</td>
<td>60/16</td>
<td>Daily telephone call and videophone call reminders/research assistants/6 weeks</td>
<td>MEMS® caps</td>
<td>No statistically significant difference between intervention groups</td>
</tr>
<tr>
<td>Goldstein et al. (2014)</td>
<td>Feasibility, quasi-experimental</td>
<td>60/8</td>
<td>Four groups (smartphone application [app] for recording medication taking, smartphone reminder app, pillbox [no reminder], and pillbox with reminder)/research assistants/28 days</td>
<td>Bin opening or self-report on app</td>
<td>Device type not associated with medication adherence</td>
</tr>
<tr>
<td>Goodyer, Miskelly, &amp; Milligan (1995)</td>
<td>RCT</td>
<td>100/18</td>
<td>Medication counseling, calendar, and medication information/pharmacist/3 months</td>
<td>Tablet count</td>
<td>Counseled group had statistically higher compliance than the control group (p &lt; 0.001)</td>
</tr>
<tr>
<td>Murray et al. (2007)</td>
<td>RCT</td>
<td>314/14</td>
<td>Icon placed on medication bottle and instruction sheet, and written and verbal education/pharmacist/9 months</td>
<td>MEMS caps and refill adherence medication possession ratio</td>
<td>Intervention group had a statistically higher refill adherence than the control group (p = 0.007)</td>
</tr>
<tr>
<td>Rich, Gray, Beckham, Wittenberg, &amp; Luther (1996)</td>
<td>RCT</td>
<td>156/0</td>
<td>Teaching, medication simplification, and contact by nurse regularly after discharge/nurse, dietitians, social worker, pharmacist, and home health nurses/hospital admission and 30 days post-hospitalization</td>
<td>Pill count</td>
<td>Intervention group had statistically higher medication adherence than the control group (p = 0.003)</td>
</tr>
<tr>
<td>Varna, McElney, Hughes, Passmore, &amp; Varma (1999)</td>
<td>Pilot RCT</td>
<td>83/40</td>
<td>Education, use of diary cards, and medication simplification/pharmacist/12 months</td>
<td>Self-report and drug use profiles</td>
<td>Intervention group had statistically higher compliance with drug therapy (p = 0.039)</td>
</tr>
</tbody>
</table>
improvement in medication adherence (Barnason et al., 2010).

Study intervention types included educational, affective, and behavioral. Education was used in six studies (Barnason et al., 2010; Goodyer et al., 1995; Varma et al., 1999). Counseling, which is an affective intervention, was used in two studies (Fulmer et al., 1999; Goldstein et al., 2014). Behavioral interventions were used in seven studies and included: decreasing dose regimens, telephone follow up, diary cards, and using an icon on the medication bottle. Counseling was also on the medication information sheet. Phone reminder, phone application recording of medication taking, pillboxes with reminders, and intervention device (Barnason et al., 2003; Murray et al., 2007; Rich et al., 1996).

Medication adherence can be measured using objective (e.g., pill counts, electronic measuring devices, refill reports, supervised dosing, blood drug levels or subjective [e.g., self-report, provider assessment].

Four studies used objective measures (Fulmer et al., 1999; Goldstein et al., 2014; Varma et al., 1999). Two studies used a combination of subjective and objective measures (Goldstein et al., 2014; Varma et al., 1999). Goodyer et al. (1995) used objective measures in one group and subjective measures in another group.

**TABLE 2**

<table>
<thead>
<tr>
<th>Study</th>
<th>Reporting</th>
<th>External Validity</th>
<th>Internal Validity—Bias</th>
<th>Internal Validity—Confounding (Selection Bias)</th>
<th>Power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnason, Zimmerman, Hertzog, &amp; Schulz (2010)</td>
<td>7</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Barnason et al. (2003)</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Fulmer et al. (1999)</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Goldstein et al. (2014)</td>
<td>7</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Goodyer, Miskelly, &amp; Milligan (1995)</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Murray et al. (2007)</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>Rich, Gray, Beckham, Wittenberg, &amp; Luther (1996)</td>
<td>7</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Varma, McElroy, Hughes, Passmore, &amp; Varma (1999)</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>16</td>
</tr>
</tbody>
</table>

*Higher scores for each measure indicate higher quality of the study. Ranges for each measure are as follows: reporting, 0 to 11; external validity, 0 to 3; internal validity—bias, 0 to 7; internal validity—confounding, 0 to 6; power, 0 to 5; and total, 0 to 32.
Use of technology can be challenging in the older adult population due to physical changes and decreased use.

Five studies (63%) documented a statistically significant improvement in medication adherence rates in the intervention group (Barnason et al., 2010; Goodyer et al., 1995; Murray et al., 2007; Rich et al., 1996; Varma et al., 1999). One study did not have a control group but had two intervention groups comparing two different reminder devices; there was no significant difference in adherence rates between devices (Goldstein et al., 2014). Two studies showed no significant difference in medication adherence rates (Barnason et al., 2003; Fulmer et al., 1999). These three studies used technology in the intervention.

DISCUSSION

The purpose of the current article was to systematically review RCTs and quasi-experimental intervention studies designed to improve medication adherence in older adults with heart failure. Five of eight studies (63%) found a statistically significant improvement in medication adherence in intervention groups. All five studies used a combination of educational, behavioral, and affective interventions. These findings are consistent with previous research that suggests combined interventions have a greater impact on improving adherence (Conn et al., 2009; Roter et al., 1998; van Dalem, Krass, & Aslani, 2012).

Conn et al. (2009) found that behavioral interventions, including dosing simplification and reminder cues, had large adherence effect sizes in older adults. In the current review, dosing simplification was used in two studies and reminder cues in two studies, with statistically significant improvement in medication adherence.

Pharmacists performed the intervention in four studies, showing significant improvement in medication adherence (Goodyer et al., 1995; Murray et al., 2007; Rich et al., 1996; Varma et al., 1999). A previous systematic review on interventions to improve medication adherence in the heart failure population also found the use of pharmacists as interventionists to be beneficial (Molloy et al., 2012). Two studies that did not show a statistically significant improvement in medication adherence comprised a telephone device that focused on positive reinforcement to improve self-efficacy (Barnason et al., 2003).

The longest follow up of medication adherence was 3 months in three studies (Barnason et al., 2010; Barnason et al., 2003; Murray et al., 2007). Heart failure is a progressive disease in which medications must be taken indefinitely. As the disease progresses, symptoms worsen, which can make medication adherence a further challenge (Heart Failure Society of America, 2010; Sabaté, 2003), supporting the need for research on the long-term effect of interventions on medication adherence (Haynes, Ackloo, Sahota, McDonald, & Yao, 2008; Molloy et al., 2012).

Quality scoring of the studies using the Downs and Black (1998) tool revealed that the studies are of average quality. All of the studies took place in clinics or hospitals, which is the typical setting in which patients with heart failure receive care. Use of results is impacted due to small samples, lack of generalizability, and average quality scoring. A prior systematic review on medication adherence interventions in patients with heart failure also concluded there was a lack of high-quality evidence (Molloy et al., 2012).

Only two studies used theory, emphasizing the need for more theory-driven intervention studies (Banning, 2009; Conn et al., 2009; Ruppar, 2010; Russell, Conn, & Jantarakupt, 2006). Of these two studies, one had a statistically significant improvement in medication adherence. This intervention comprised education and counseling that focused on the concepts of self-care and self-regulation (Barnason et al., 2010). The intervention in the study that did not show a significant improvement in adherence comprised a telephone device that focused on positive reinforcement to improve self-efficacy (Barnason et al., 2003).

sures in another group. Four studies measured adherence immediately after the intervention (Goldstein et al., 2014; Goodyer et al., 1995; Rich et al., 1996; Varma et al., 1999), one measured adherence 2 weeks post-intervention (Fulmer et al., 1999), and three measured adherence 3 months post-intervention (Barnason et al., 2010; Barnason et al., 2003; Murray et al., 2007).
Four studies that significantly improved medication adherence used interventions that focused solely on medication adherence (Barnason et al., 2010; Murray et al., 2007; Rich et al., 1996; Varma et al., 1999). A recent meta-analysis found that focusing on only one health behavior at a time has larger effect sizes than focusing on multiple health behaviors (Ruppar, Delgado, & Temple, 2015). A change is more likely to occur when focusing on one behavior because it is easier for the individual to achieve.

STRENGTHS AND LIMITATIONS

Various strengths are noted in the intervention studies. The first strength is that seven of eight studies (87.5%) used a RCT design, which is considered the gold standard for determining cause and effect and produces a high level of evidence (Polit, 2008). An additional strength is that six studies (83.3%) used objective measures of medication adherence, such as pill counts and electronic monitoring devices. Objective measures are seen as gold standard because subjective measures tend to overreport adherence (O’Donohue & Levensky, 2006). Other study strengths were noted during quality assessment. All studies had a clear aim, outcome, and inclusion criteria. The settings selected and interventionists used were representative of the general settings in which treatment is normally received. The interventions were also performed so that internal validity was maintained.

Limitations were noted in the current systematic review and reviewed studies. Despite using a systematic search process, some studies may have been missed. To minimize the chance of missing articles, a health sciences research librarian was used in the search.

Limitations of the reviewed studies include no measurement of long-term effects, small samples that limited power, and four of eight studies were published in the 1990s. There is a need for research studying long-term effects of interventions, which was not satisfied by the longest follow up of 3 months. Three studies were pilot studies, which explains the small samples. However, only one study used a power analysis to determine sample size, increasing the risk of a type II error or accepting a false null hypothesis (Polit, 2008). No publication date restriction was used as inclusion criteria so that adequate study numbers could be included. One disadvantage of studies published more than 10 years ago is that technology has advanced, making the interventions (e.g., using home telephones for reminders) out of date.

To prevent the “ceiling” effect, it is best to include only nonadherent patients in studies. Only one study attempted to include nonadherent patients (Barnason et al., 2010). Adherence was not screened prior to the start of the study but only participants at risk for low medication adherence (taking five or more medications) were included, which is not a good measure of nonadherence.

Quality of the articles was average. Weaknesses noted in most studies regarded external validity, meaning the study results may not be generalizable to the larger population (Polit, 2008). There were also weaknesses noted in the selection of participants in most of the studies.

IMPLICATIONS

Current findings suggest guidance for future research studies. Medication adherence is challenging, particularly in older adults with heart failure. The populations of patients with heart failure and older adults with heart failure possess different challenges to adherence, so studying the populations together is needed. Few studies exist using this combined population, making it difficult to make practice changes. Studies that use objective measures, larger samples, include solely nonadherent patients, and study long-term effects can enhance medication adherence knowledge.

Only two studies reviewed used theories as a framework. Based on previous research, there is a need for additional interventions using theory (Ruppar, 2010). The social cognitive theory was used in these two studies. This theory tends to focus more on the individual. A significant amount of research exists on improving medication adherence focusing on behavior changes at the individual level; however, there has not been an improvement in medication adherence (Haynes et al., 2008; Kripalani, Yao, & Haynes, 2007; Russell et al., 2006). There is a need for interventions that focus on multilevel influences and consider environmental factors (Berben et al., 2015; Russell, Ruppar, & Matteson, 2011). Linking medication taking to existing habits has been found to improve medication adherence (Conn, Ruppar, Enriquez, & Cooper, 2016).

Improving adherence to medications that decrease symptoms and ultimately mortality should be a focus of all health care providers. The current findings can help health care providers identify useful interventions to improve medication adherence in older adults with heart failure and use them in practice. Adherence should be assessed and interventions using a combination of approaches should be implemented. Medication regimens should be simplified if clinically possible. An interdisciplinary approach including pharmacists should be followed. Changes in behavior should focus on one behavior at a time. A plan to use reminder cues should also be initiated. Although education alone does not improve adherence, it is an important component of combined interventions. Nurses can provide health teaching and information about intended effects of therapies, such as medications, which is part of the American Nurses Association’s (2010) standards of professional nursing practice.
CONCLUSION

Eight studies that trialed interventions to improve medication adherence in older adults with heart failure were reviewed. The five studies that showed significant improvement in medication adherence used combined intervention approaches. By reviewing strengths and limitations of these studies and comparing to the literature, guidance for future studies can be established. There is a need for interventions that use theory and intervention components found to be previously effective. Study designs can be improved by considering external validity, having larger samples, measuring long-term effects, and including only nonadherent patients.

Medication nonadherence in heart failure leads to poor patient outcomes, including symptom exacerbation, hospital admissions, and death (van der Wal & Jaarsma, 2008). Medication adherence is so crucial that the World Health Organization posed that improving medication adherence can have a greater effect on health than formulating new medical treatments (Sabaté, 2003). Formulating new interventions to improve medication adherence in older adults with heart failure and testing their effectiveness in high-quality research should be a priority.

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