Technology Fluency is not a Barrier to User Adoption of a Mobile Health Wrist-worn Physical Activity (PA) Monitor System

The Washington, D.C. Cardiovascular Health and Needs Assessment

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Presenter Disclosure Information

FINANCIAL DISCLOSURE:
No relevant financial relationships exist.

The views expressed in this presentation are those of the authors and do not necessarily represent the views of the National Heart, Lung, and Blood Institute; the National Institutes of Health; or the U.S. Department of Health and Human Services.
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“We know the least about those populations with the highest obesity rates and those who bear the greatest burden of obesity associated disease: racial/ethnic minorities and the socioeconomically disadvantaged. This fails to deliver on the promise of digital health approaches, which have potential for extending the reach of intervention approaches.”

Burke et al.

- Creating
- Collaborating
- Connecting

- Navigation skills
- Accessing skills

- Distribution
- Infrastructure
- Tools

- Innovation
- Use
- Access

“Have Nots”

“Haves”

Digital Divide
TECHNOLOGY FLUENCY

- Navigation skills
- Accessing skills

Use

“Have Nots”

Digital Divide

“Haves”
Will technology fluency impact usage of a community-based wearable PA-monitor system?
We targeted Washington, D.C. wards with the highest obesity rates

Washington, DC
Median Household Income = $66,000*

Ward 5 Median Household Income = $53,000*

*p<0.01 comparing income in Wards vs. overall city

Ward 7 Median Household Income= $39,000*

Ward 8 Median Household Income = $30,000*

Behavioral Risk Factor Surveillance Survey (CDC); U.S. Census 2009-13
Community-based Cardiovascular Health and Needs Assessment

Station 1
Participant Registration

Station 2
• Blood Testing
• Blood Pressure
• Body Size Measurement

Station 3
Survey Assessment

Station 4
Device Training

Station 5
Review of Results with Physician

Station 6
Check out/Voucher Distribution
Welcome & wristband distribution

Overview of expectations for 30-day period

Instructional Video #1: Using the wristband and online account

Instructional Video #2: Syncing wristband at hub

Question & Answers

One-on-one training, as needed
Data was uploaded weekly to the hub.
The hub allowed for us to overcome potential technology barriers

- Socioeconomic and geographic barriers to broadband network and Wi-Fi access
- Limited access to computers
- Restricted data plans for use of mHealth devices
Technology fluency was captured during survey completion at Station 3.
Tech fluency was measured with the Computer-Email-Web Fluency Scale.

101. The following questions are about a variety of computer, email and web-related tasks. For each statement, check one box to indicate your answer choice.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Not so well</th>
<th>Okay</th>
<th>Well</th>
<th>Very Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I can switch a computer on.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. I can restart a computer.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

- Participants (n=99) completed a survey on technology access, usage, and fluency.
- 17 items measured.
HYPOTHESIS:
Technology fluency would differ among those who used the PA-monitoring system and those who did not.
RESULTS
81% of participants uploaded PA data

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Users (N=81)</th>
<th>Non-Users (N=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (SD)*</td>
<td>60 (12)</td>
<td>57 (13)</td>
</tr>
<tr>
<td>Male (%)</td>
<td>22%</td>
<td>16%</td>
</tr>
<tr>
<td>African-American Race</td>
<td>99%</td>
<td>100%</td>
</tr>
<tr>
<td>Body Mass Index, kg/m² (SD)*</td>
<td>32 (7)</td>
<td>35 (7)</td>
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*Standard Deviation
PA levels were suboptimal among users

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<td>Body Mass Index, kg/m² (SD)*</td>
<td>32 (7)</td>
<td>35 (7)</td>
</tr>
<tr>
<td>Mean Steps (SD)*</td>
<td>7013 (5182)</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>[999, 20,628]</td>
<td></td>
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*Standard Deviation

23% of users <5000 steps
PA monitor users had lower annual household income

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<tr>
<td>Household Income &lt;$60,000</td>
<td>51%</td>
<td>27% p= 0.01</td>
</tr>
<tr>
<td>Employed</td>
<td>46%</td>
<td>56%</td>
</tr>
<tr>
<td>Some College Education</td>
<td>76%</td>
<td>83%</td>
</tr>
<tr>
<td>Has Health Insurance</td>
<td>98%</td>
<td>100%</td>
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Technology access was similar across user and non-user groups

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<tr>
<td>Has Health Insurance</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>Computer Access</td>
<td>94%</td>
<td>94%</td>
</tr>
<tr>
<td>Mobile Phone Owner</td>
<td>88%</td>
<td>89%</td>
</tr>
</tbody>
</table>
Computer use skills were similar across user and non-user groups

<table>
<thead>
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<th>Task</th>
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<th>Non-Users</th>
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<tbody>
<tr>
<td>I can switch a computer on.</td>
<td>3.96</td>
<td>4.06</td>
</tr>
<tr>
<td><strong>I can restart a computer.</strong></td>
<td><strong>3.89</strong></td>
<td><strong>4.17</strong></td>
</tr>
<tr>
<td>I can begin typing a new document.</td>
<td>3.80</td>
<td>4.00</td>
</tr>
<tr>
<td>I can open a previously saved file from any directory.</td>
<td>3.76</td>
<td>3.89</td>
</tr>
<tr>
<td>I can use “save as” when appropriate.</td>
<td>3.81</td>
<td>3.89</td>
</tr>
<tr>
<td>I can print a document.</td>
<td>3.89</td>
<td>3.94</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.85</strong></td>
<td><strong>3.99</strong></td>
</tr>
</tbody>
</table>

*P-value=0.05

Minimum= 1: No Fluency → Maximum= 5: High Fluency
Email use skills were similar across user and non-user groups

<table>
<thead>
<tr>
<th>Task</th>
<th>Users</th>
<th>Non-Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can open an email program.</td>
<td>3.86</td>
<td>4.00</td>
</tr>
<tr>
<td>I can read new email messages</td>
<td>3.92</td>
<td>4.06</td>
</tr>
<tr>
<td>I can open a file attached to an email.</td>
<td>3.80</td>
<td>3.88</td>
</tr>
<tr>
<td>I can delete read email messages.</td>
<td>3.88</td>
<td>4.00</td>
</tr>
<tr>
<td>I can send an email message.</td>
<td>3.82</td>
<td>4.06</td>
</tr>
<tr>
<td>I can use the reply and forward features for email.</td>
<td>3.86</td>
<td>3.94</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.88</strong></td>
<td><strong>3.99</strong></td>
</tr>
</tbody>
</table>

Minimum= 1: No Fluency  →  Maximum= 5: High Fluency
Web navigation skills were similar across user and non-user groups

<table>
<thead>
<tr>
<th>Task</th>
<th>Users</th>
<th>Non-Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can use a browser to navigate the web.</td>
<td>3.75</td>
<td>3.94</td>
</tr>
<tr>
<td>I can open a web address directly.</td>
<td>3.69</td>
<td>3.89</td>
</tr>
<tr>
<td>I can identify the host server from the web address.</td>
<td>3.54</td>
<td>3.72</td>
</tr>
<tr>
<td>I can use “back” and “forward” to move between web pages.</td>
<td>3.80</td>
<td>3.72</td>
</tr>
<tr>
<td>I can use search engines (e.g. Google).</td>
<td>3.80</td>
<td>3.67</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.70</td>
<td>3.78</td>
</tr>
</tbody>
</table>

Minimum = 1: No Fluency  →  Maximum = 5: High Fluency
Strengths

• Community-based data collection hub to overcome barriers to network and Wi-Fi access

• Validated tool to capture technology fluency

• Contributes to prioritized mHealth research among racial/ethnic minority and socially disadvantaged populations
Limitations

• Results not generalizable to all populations

• 30-day period may not be sufficient to assess engagement, adherence and attrition

• Limited data available on wearable device or smartphone ownership
Conclusions and Implications

• PA levels are suboptimal in target population.

• Lower technology fluency does not appear to impede engagement with this PA-monitoring system, despite lower income among users.

• The use of a hub-based, mHealth PA-monitoring system may aid in reaching at-risk communities with varying degrees of technology fluency.
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• Powell-Wiley Research Group
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  o Riley Cooper-McCann
  o Michael McClurkin
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  o Valerie Mitchell
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  o JaWanna Henry
  o Nathan Coffey
  o Samantha Thomas
  o Joel Adu-Brimpong

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• Faith-based Organizations
  o Plymouth Congregational UCC
  o St John CME Church
  o Pilgrim Rest Baptist Church
  o New Samaritan Baptist Church
  o Pennsylvania Ave Baptist Church
  o First Baptist Church, Washington DC

• Members of DC Cardiovascular Health and Obesity Collaborative
Thank you!

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Sub-optimal PA levels among most participants in pilot testing

N=8 (ages 28-70)

*Median steps= 7580 (4967, 11972)

10,000 steps/day (active)

5,000 steps/day (sedentary)

Yingling LR et al., Powell-Wiley TM (2016) JMIR mHealth uHealth
PA levels can be a target for intervening on obesity

<table>
<thead>
<tr>
<th>Physical Activity (Mean steps/day by wristband PA monitor)</th>
<th>Normal Weight</th>
<th>Overweight</th>
<th>Class I Obese</th>
<th>Class II Obese</th>
<th>Class III Obese</th>
<th>P-trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>7698</td>
<td>7036</td>
<td>8114</td>
<td>6752</td>
<td>5131</td>
<td>0.05</td>
</tr>
<tr>
<td>Men</td>
<td>7666</td>
<td>7379</td>
<td>5276</td>
<td>9972</td>
<td>6037</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Thomas, S, Yingling, L.R .. Powell-Wiley TM– Submitted